4

NON-RESIDENTIAL PROPERTIES

The non-residential property category includes industrial and commercial properties, institutions (such as hospitals, nursing homes, prisons), educational establishments (from preschool through university), mobile properties, and properties that are vacant or under construction. Each of these categories corresponds to one of the major divisions of the NFPA 901 coding system used by NFIRS. Each is quite different, and their cause profiles and magnitudes need to be examined separately.

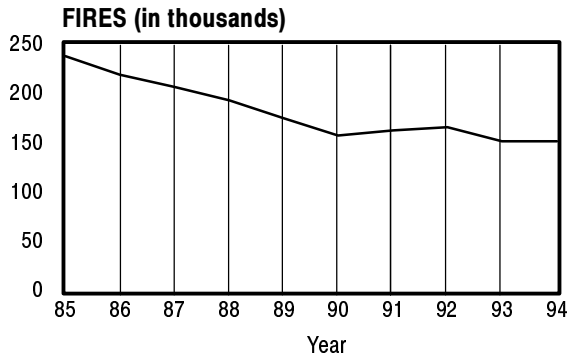
NON-RESIDENTIAL STRUCTURES

Magnitude and Trends

Much of the effort in fire prevention, both public and private, has gone into protecting non-residential structures, and the results have been highly effective in the main, especially relative to the residential fire problem. Even with all the diverse properties included here, non-residential structures consistently accounted for only 5–6 percent of the fire deaths annually, as was shown in Figure 28, Chapter 2. They also accounted for 13–14 percent of all fire injuries, 32–46 percent of total fire dollar loss, and 9–10 percent of all fires. These proportions tended to be similar over the 10-year period.

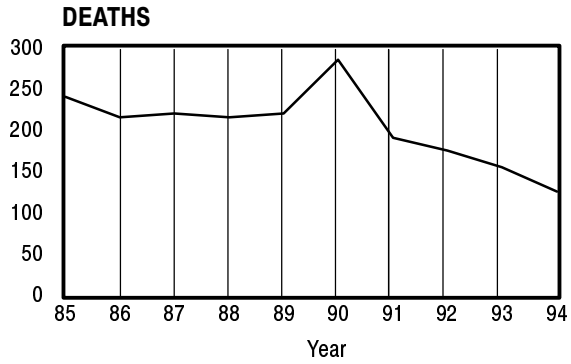
In absolute numbers, non-residential fire deaths from 1985 to 1994 dropped from 240 to 125, or 37 percent (Figure 72). In 1994, total deaths were at a 10-year low, but they jumped 30 percent in the non-residential category from 1989 to 1990. Figure 72 also shows that non-residential dollar loss adjusted to 1994 dollars and total fires trended downward, by a large 30 and 38 percent, respectively; injuries were down 10 percent.

Figure 73 shows the relative magnitudes of the fire problem in non-residential structures by its component property categories for 1994. Storage facilities, institutions, and manufacturing plants were the three leading property types for deaths, by themselves accounting for 50 percent of the non-residential fire deaths. This will surprise many, who might expect nursing homes, dormitories, or nightclubs to be high. However, one large incident in a particular category (such as the Beverly Hills Nightclub fire in May 1977 that took 165 lives or the Oklahoma City bombing in 1995 that claimed 168 lives) could make that category the leader in a particular year because the absolute number of deaths tends to be small for most categories in most years. In 1994, deaths in storage fires



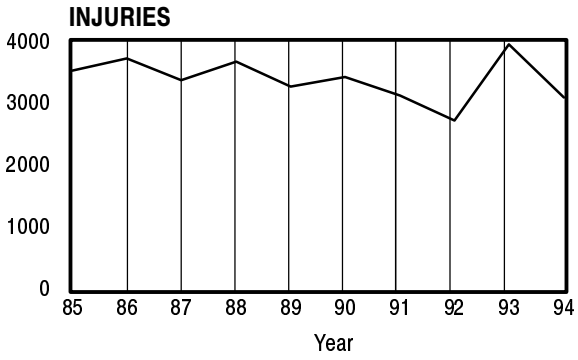
1985	237.5	1990	157.0
1986	218.5	1991	162.5
1987	206.5	1992	165.5
1988	192.5	1993	151.5
1989	174.5	1994	151.5

10-Year Trend = –37.8%



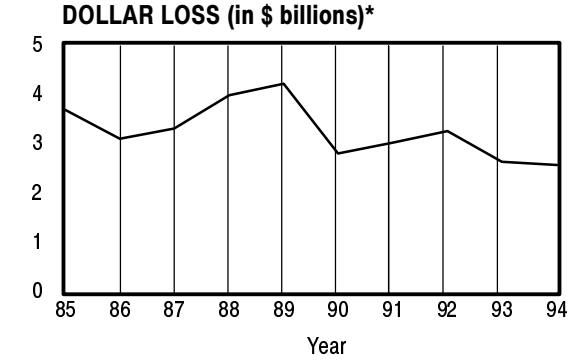
1985	240	1990	285
1986	215	1991	190
1987	220	1992	175
1988	215	1993	155
1989	220	1994	125

10-Year Trend = –36.9%



1985	3,525	1990	3,425
1986	3,725	1991	3,125
1987	3,375	1992	2,725
1988	3,675	1993	3,950
1989	3,275	1994	3,100

10-Year Trend = –10.7%



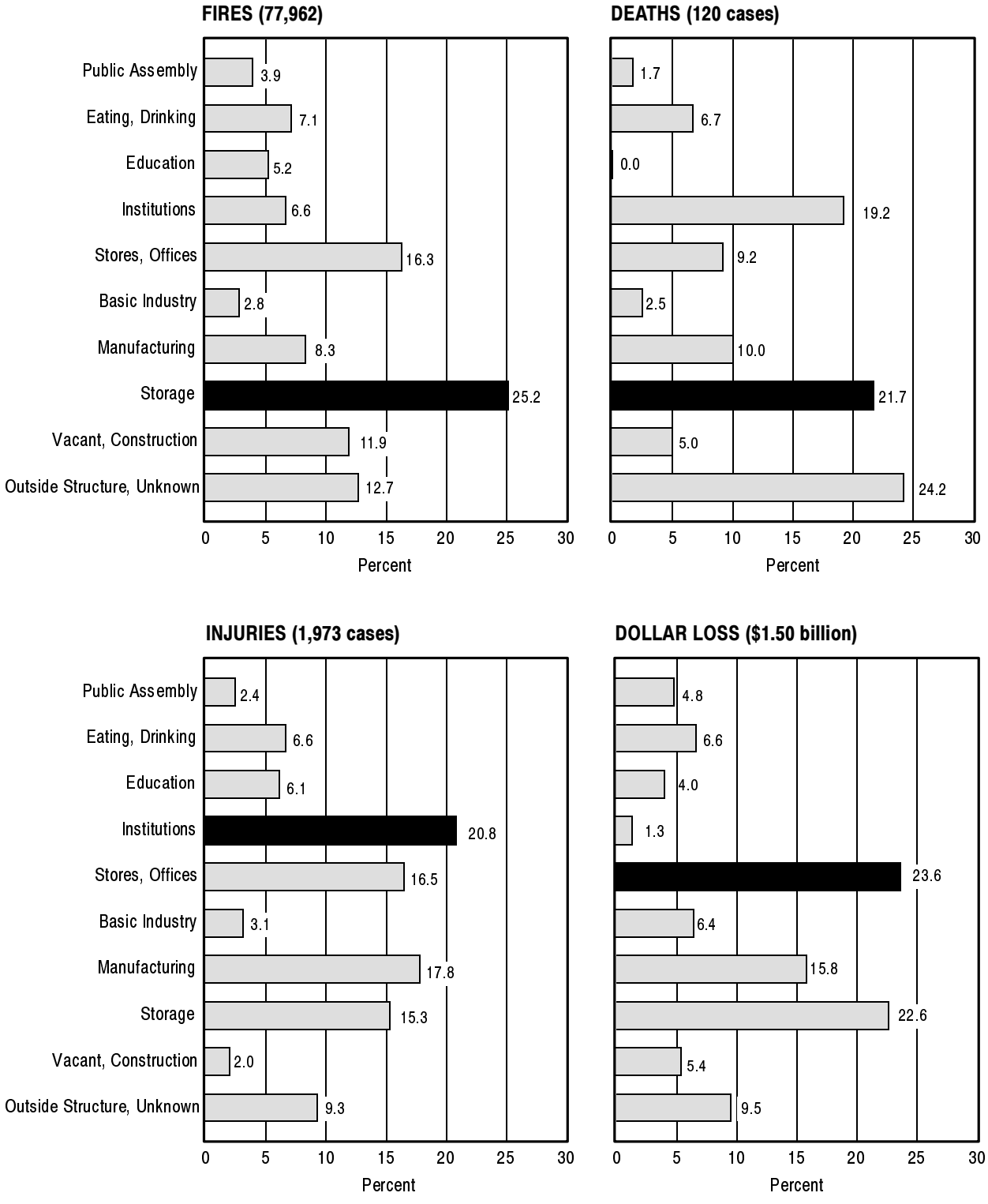
1985	$3.7	1990	$2.8
1986	3.1	1991	3.0
1987	3.3	1992	3.3
1988	4.0	1993	2.6
1989	4.2	1994	2.6

10-Year Trend = –30.1%

*Adjusted to 1994 dollars

Sources: NFPA Annual Surveys and Consumer Price Index

Figure 72. Trends in Non-Residential Fires and Fire Losses



Source: NFIRS

Figure 73. 1994 Non-Residential Fires and Fire Losses by Property Type

ranked first, whereas in 1990 it was in fourth place. Manufacturing fire deaths in 1994 dropped significantly from 1990 (23 percent vs. 10 percent).

The rank order of property types for fire injuries is similar to that for deaths, except that storage fires account for a somewhat smaller portion (15 percent injuries vs. 22 percent deaths). Institutional fires account for about 20 percent of both injuries and deaths.

In terms of dollar loss, stores/offices and storage facilities accounted for 46 percent of the total loss, the same percentage as in 1990. Storage facilities and stores/offices also led for fire incidence and represented 42 percent of all non-residential fires.[1]

The low rank ordering of some property categories should not obscure the fact that all of the categories have thousands of fires, multimillions of dollar loss, and hundreds of casualties. All parts of the fire problem need to be addressed. The relative magnitudes might help suggest where the greatest effort is needed.

When Fires Occur

TIME OF DAY. Non-residential fires are a heterogeneous category, and the time of day when each of its different component property types peak may not agree with the overall picture, which is depicted in Figure 74 for fires, deaths, injuries, and dollar loss.

The incidence of all fires has the smoothest shape variation because it is based on the largest sample. Fires peak in the afternoon and evening, from noon to 8 p.m. Perhaps this is when workers are tiring on their job and are more accident prone or careless—but that is speculation.

Fire deaths fluctuate greatly because the sample of deaths in NFIRS is fewer than ten for most 1-hour intervals. The heaviest concentration in 1994 is between 9 and 10 p.m. As in 1990, the second highest peak is between 3 and 4 a.m.

Injuries tend to be at fairly high levels throughout normal work day and evening hours, 7:00 a.m.–10:00 p.m. with the highest concentration during the workday itself, 9:00 a.m.–5:00 p.m. Fire injuries are relatively low in the nighttime and early morning period when the majority of the workforce is at home.

Peak dollar losses occur after hours, especially between 10:00 p.m. and 6:00 a.m. Their leading cause is suspected to be arson.

MONTH OF YEAR. Fires in non-residential properties are relatively uniform throughout the year, with the peak in April and the nadir in September. Nevertheless, the problem exists at a high level throughout the year (Figure 75).

[1] The rank ordering from NFPA's annual surveys are generally, but not exactly, similar to the NFIRS results above. See Appendix A for the NFPA-derived trends.

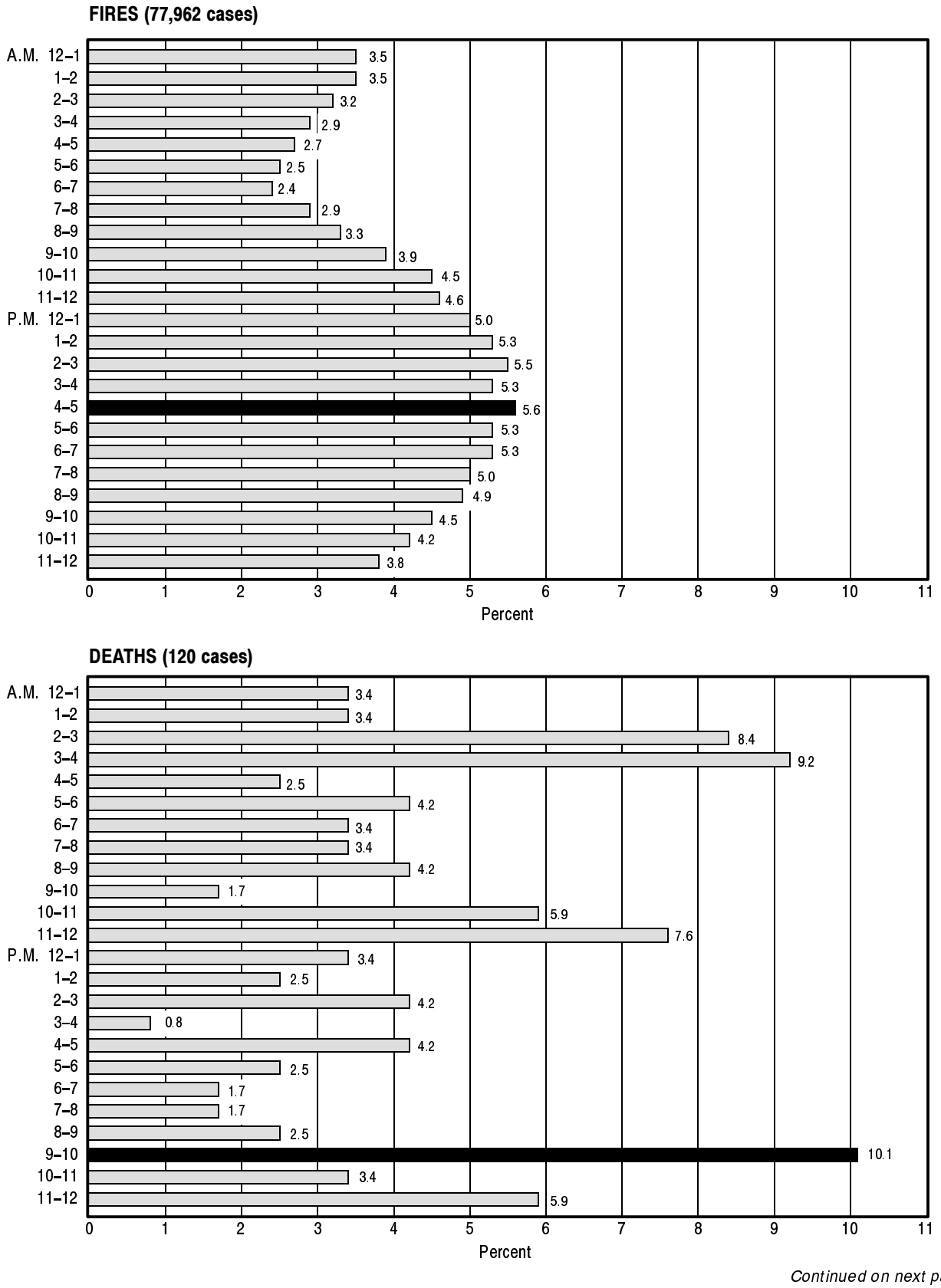


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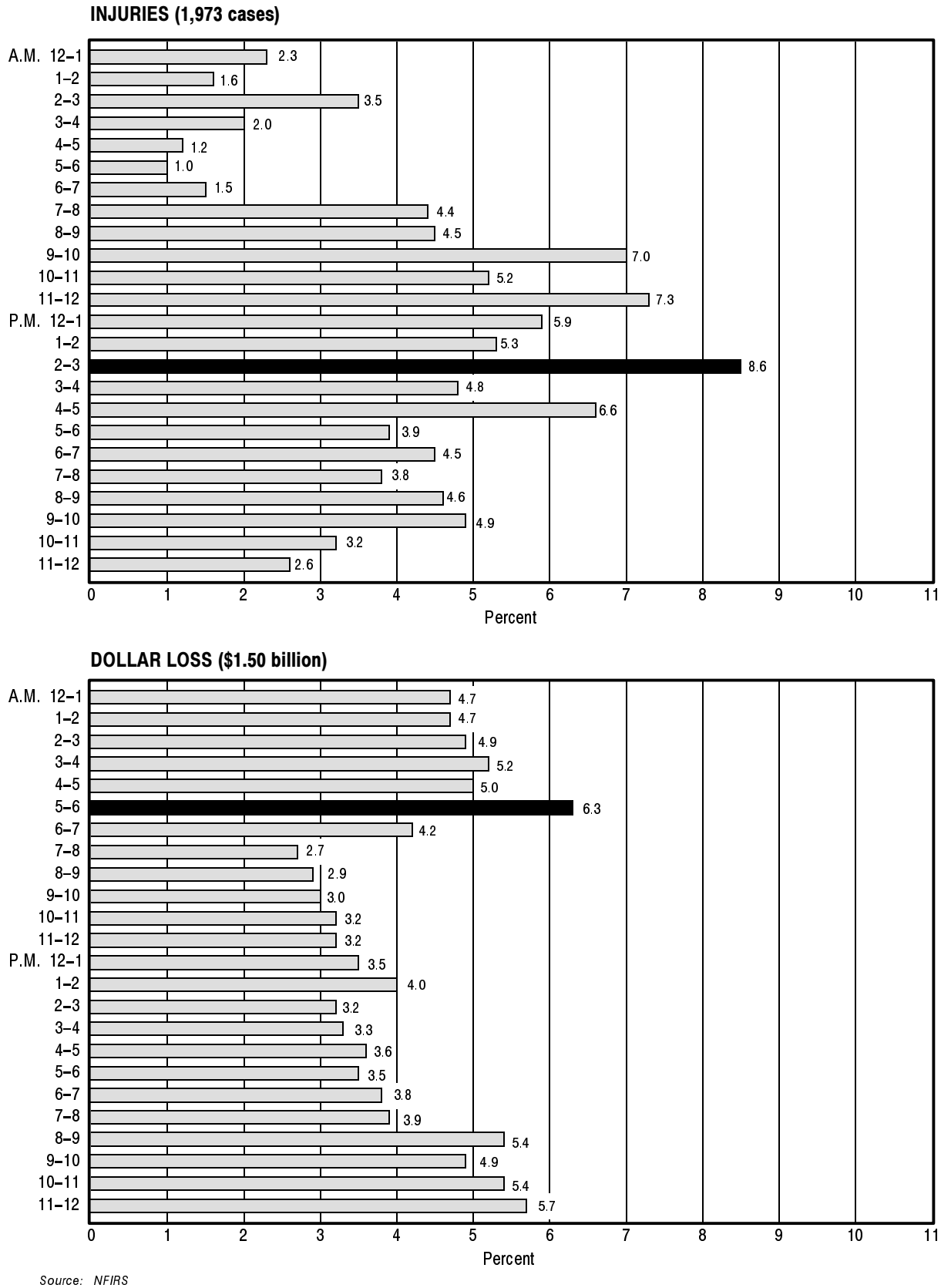
Figure 74. Time of Day of 1994 Non-Residential Fires and Fire Losses



Source: NFIRS

Figure 74. Time of Day of 1994 Non-Residential Fires and Fire Losses (cont'd)

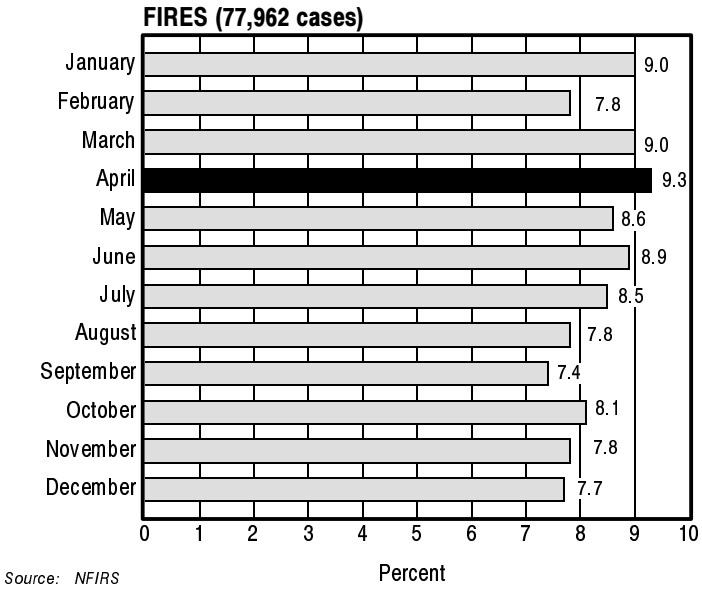


Figure 75. Month of Year of 1994 Non-Residential Fires

DAY OF WEEK. Non-residential fires are almost uniform by day of week, except that there are slightly fewer on Sundays when fewer people are at work (Figure 76). The profile is probably less uniform for subcategories of occupancies such as restaurants. There was no significant change from 1990 percentages.

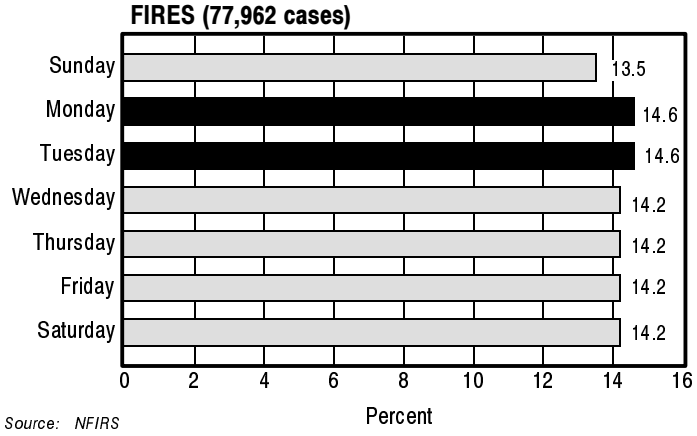
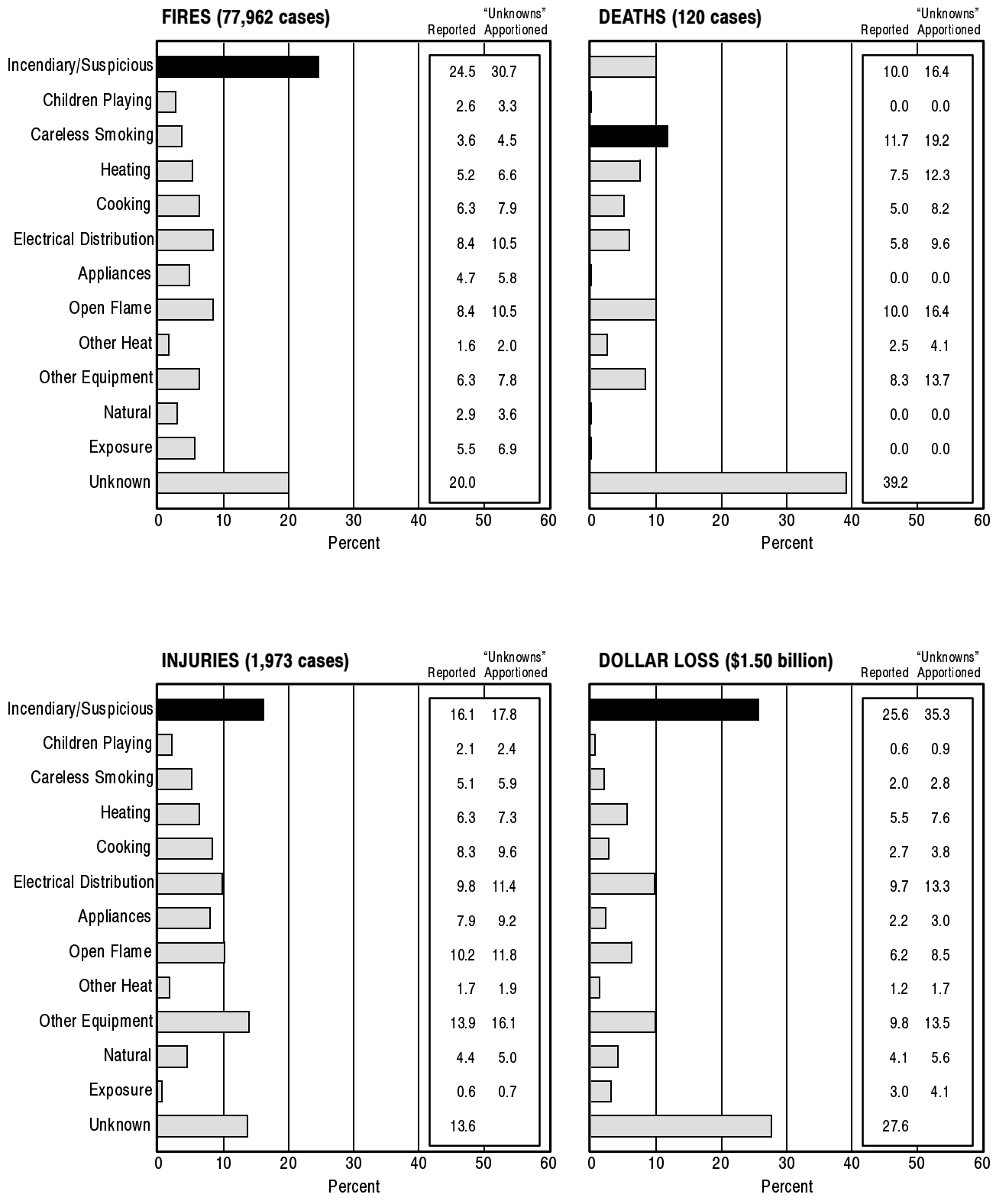


Figure 76. Day of Week of 1994 Non-Residential Fires

Causes

By far the leading cause of non-residential fires in 1994 is arson (Figure 77). Arson also accounts for more than one-third of the dollar loss. Historically, arson has accounted for the highest dollar loss and, like the overall number of fires, it has trended downward. Arson has been the leading cause



Source: NFIRS

Figure 77. Causes of 1994 Non-Residential Fires and Fire Losses

of non-residential fire deaths for 8 of the past 10 years. In 1994, however, as in 1988, smoking is the leading cause of non-residential deaths, with arson and open flame tied for second. Arson is also the leading cause of injuries, with other equipment slightly behind.

The trends in causes of non-residential fires, deaths, injuries, and dollar loss are shown in Figure 78. In most years, arson was the leading cause in all fire and fire loss categories. The causes for deaths fluctuate considerably because of the smaller numbers of cases involved. No matter how you look at it, arson is the major problem in non-residential occupancies accounting for nearly three times the number of fires in 1994 as any other cause.

Causes by Detailed Property Type

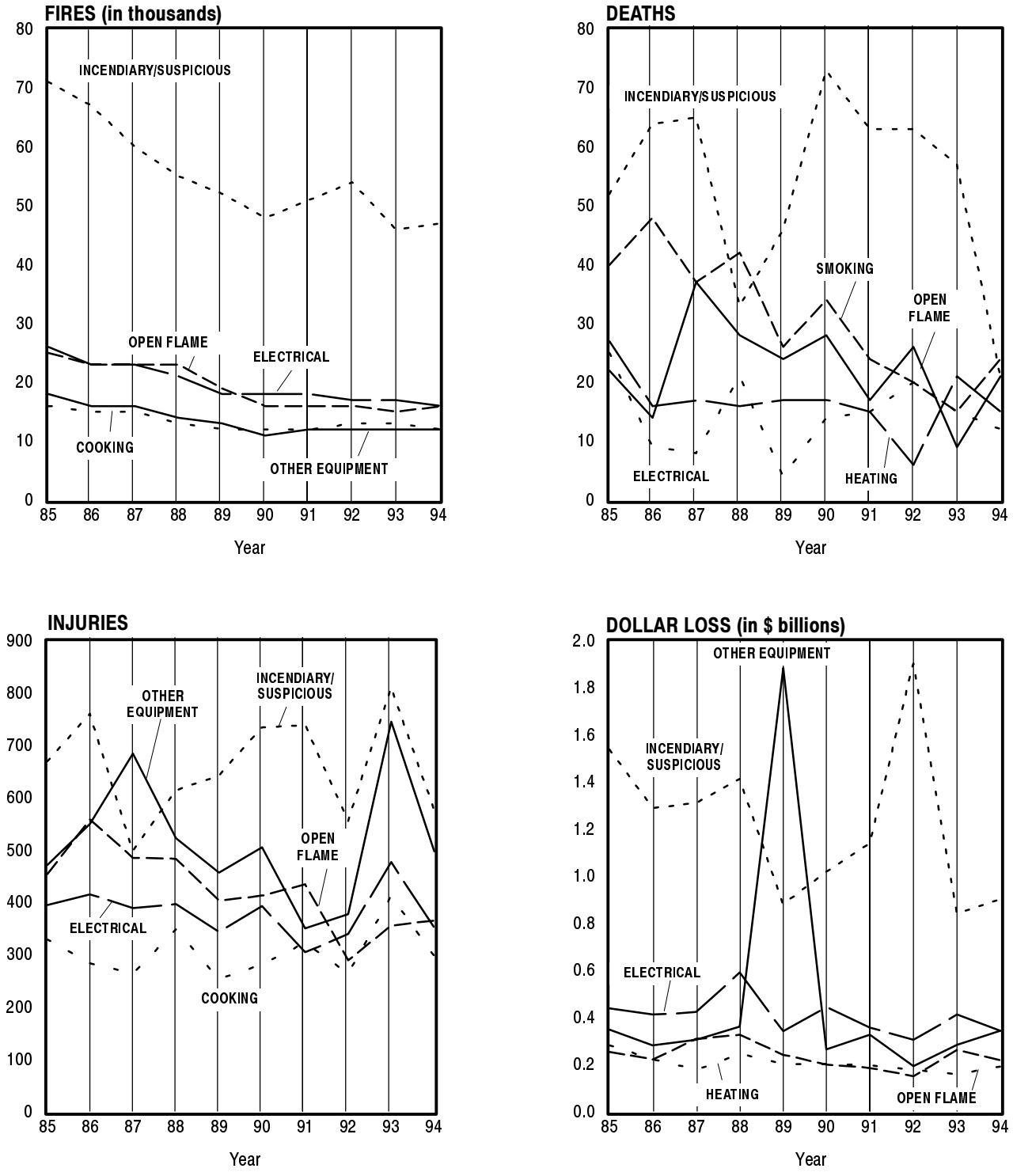
Because the dollar loss and numbers of fires in non-residential occupancies are high, the causes in terms of these two measures are given in Figures 79–88 for each non-residential category. Table 14 summarizes the leading cause of fires and fire dollar loss for each non-residential property type in 1994. Except for the basic industry, eating and drinking, and manufacturing property types, arson was the leading cause in all cases.

Electrical distribution, the leading cause of basic industry fires, is the second leading cause in fires and dollar loss across many property types. These 1994 data are quite similar to 1990 findings. Other high causes are generally related to the type of activity or equipment being used. For example, cooking is the leading cause in eating and drinking establishments. Arson is clearly the leading fire problem for non-residential properties. This has been the case for at least the past 20 years, since NFIRS was started.

Table 14. Leading Causes of 1994 Non-Residential Fires and Dollar Loss

Property Type	Fires	Dollar Loss
Public Assembly	Arson	Arson
Eating, Drinking	Cooking	Arson
Education	Arson	Arson
Institutions	Arson	Arson
Stores, Offices	Arson	Arson
Basic Industry	Electrical Distribution	Electrical Distribution
Manufacturing	Other Equipment	Other Equipment
Storage	Arson	Arson
Vacant, Construction	Arson	Arson
Outside Structures, Unknown	Arson	Arson

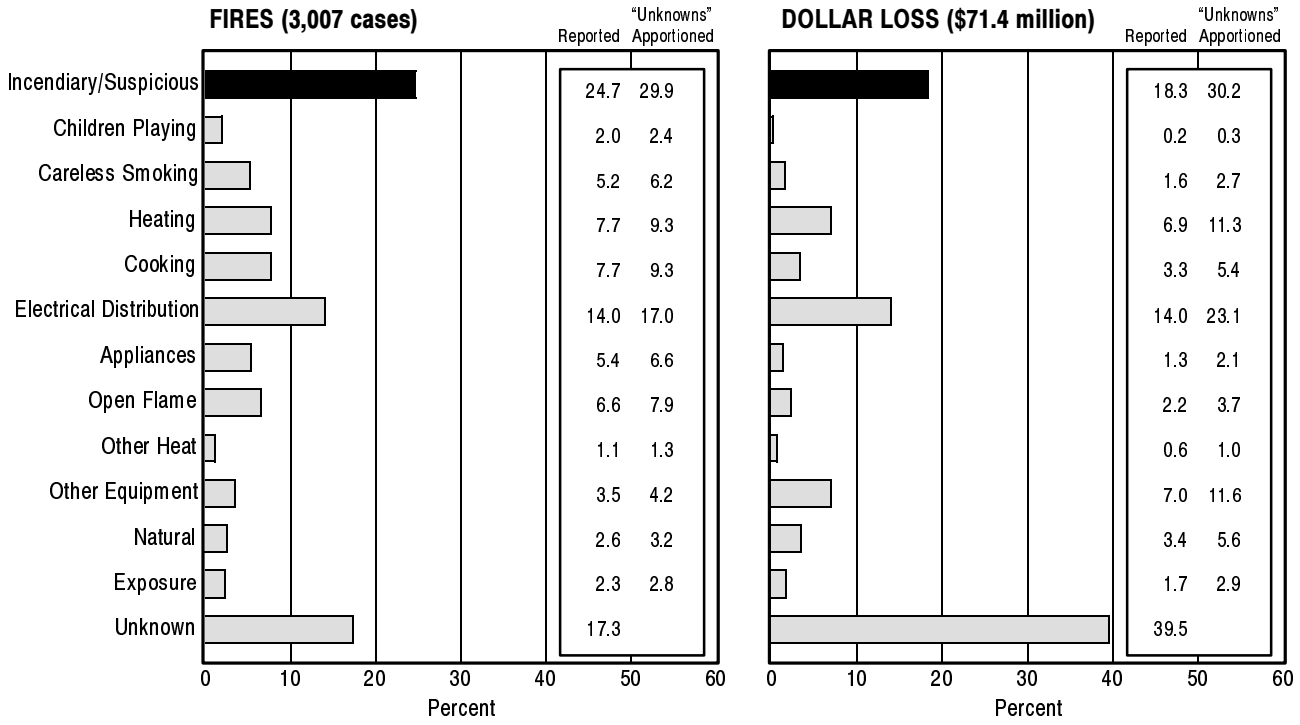
Source: NFIRS



Note: Data for all 12 causes are provided in Appendix B, Table B–5.

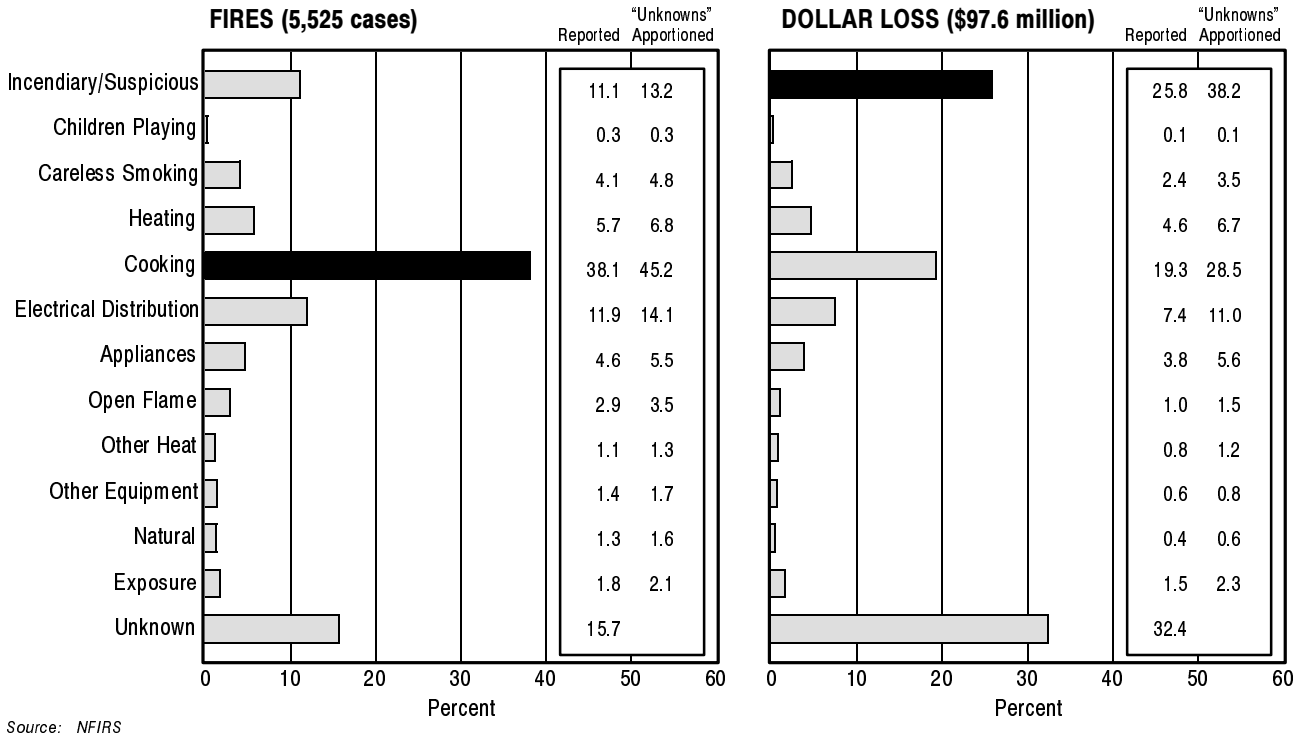
Sources: NFIRS and NFPA Annual Surveys

Figure 78. Trends in Leading Causes of Non-Residential Fires and Fire Losses



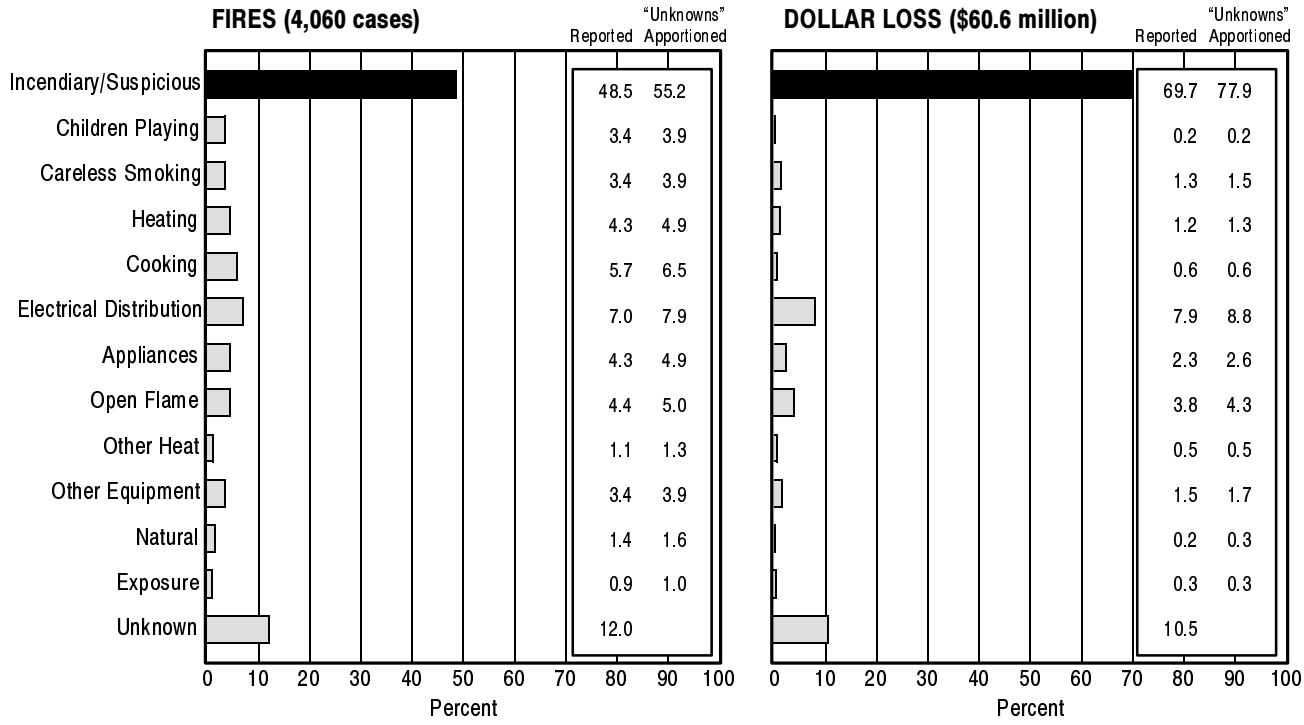
Source: NFIRS

Figure 79. Causes of 1994 Public Assembly Structure Fires and Dollar Loss



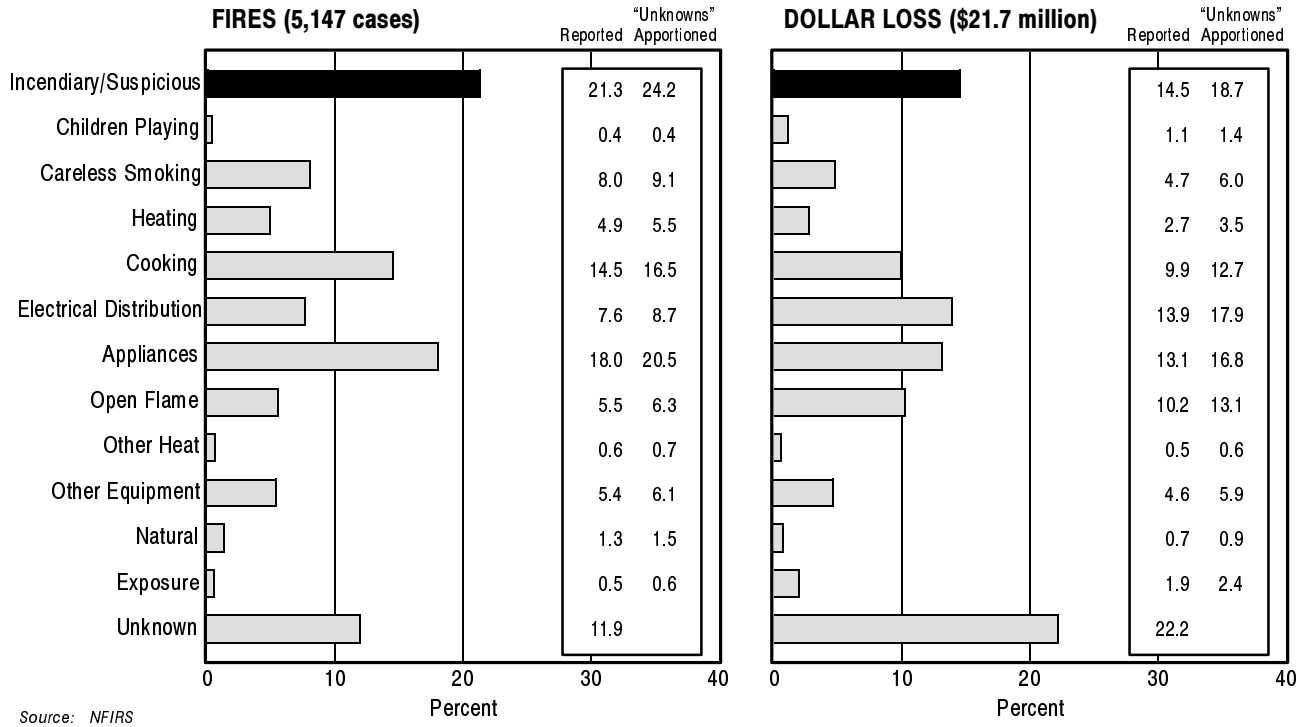
Source: NFIRS

Figure 80. Causes of 1994 Eating and Drinking Establishment Fires and Dollar Loss



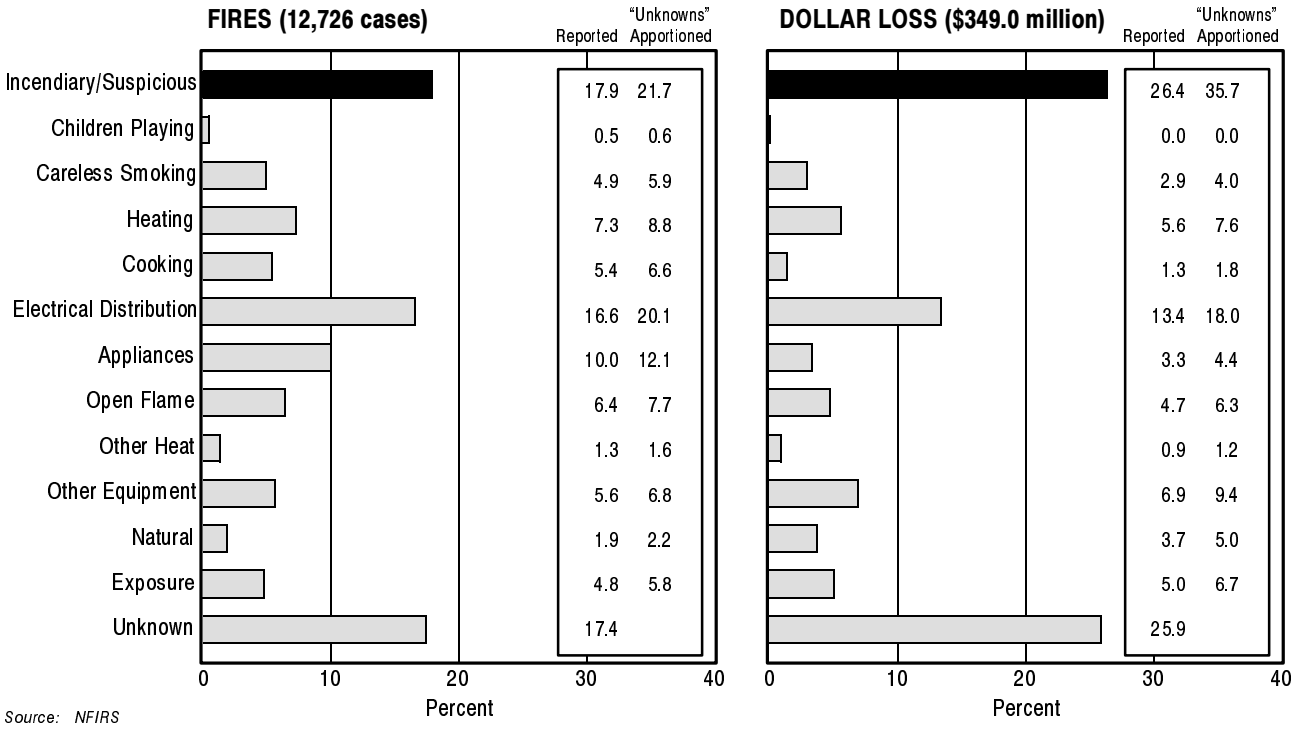
Source: NFIRS

Figure 81. Causes of 1994 Education Structure Fires and Dollar Loss



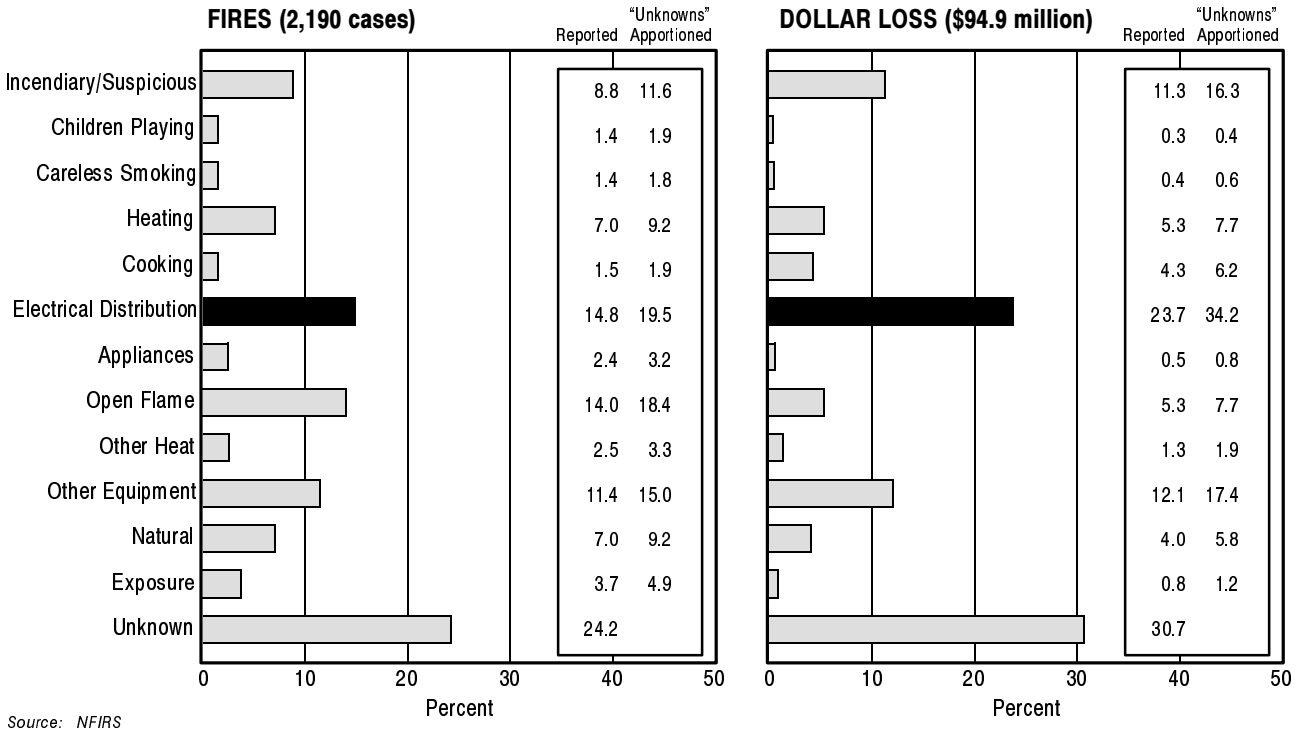
Source: NFIRS

Figure 82. Causes of 1994 Institutional Structure Fires and Dollar Loss



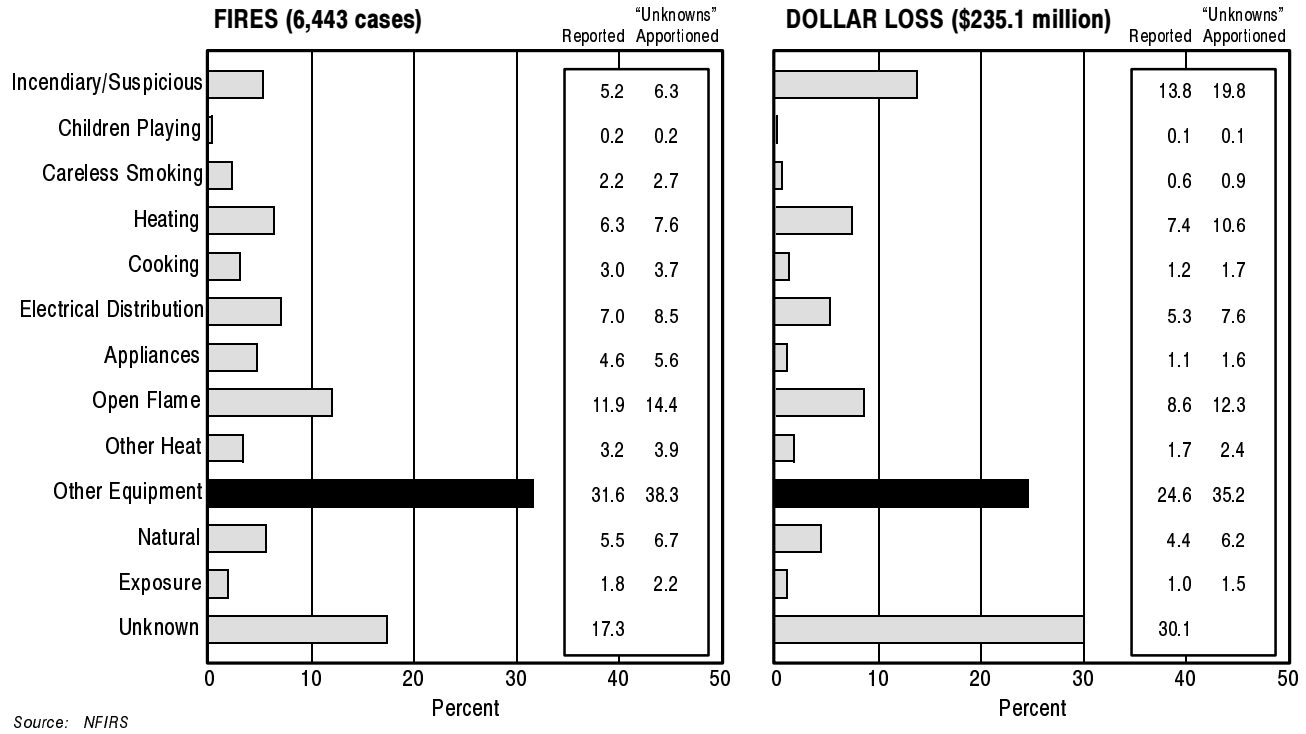
Source: NFIRS

Figure 83. Causes of 1994 Store and Office Fires and Dollar Loss



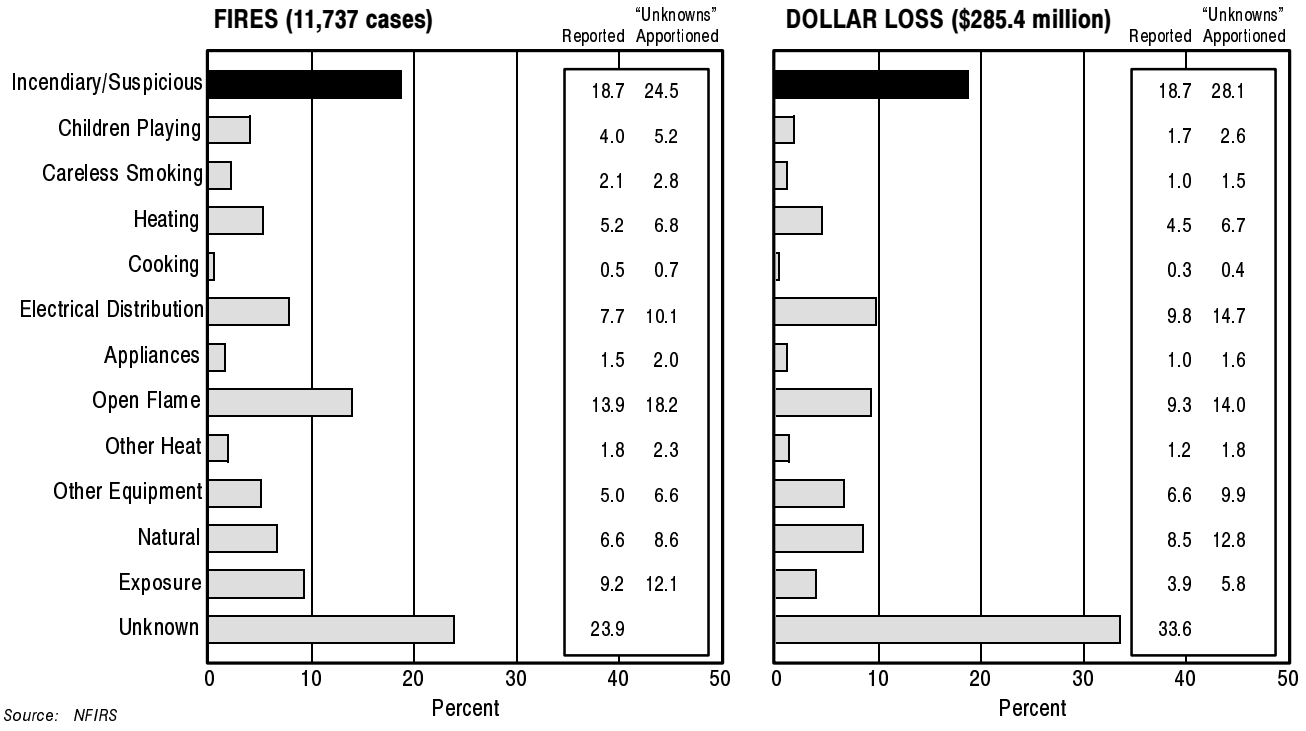
Source: NFIRS

Figure 84. Causes of 1994 Basic Industry Structure Fires and Dollar Loss



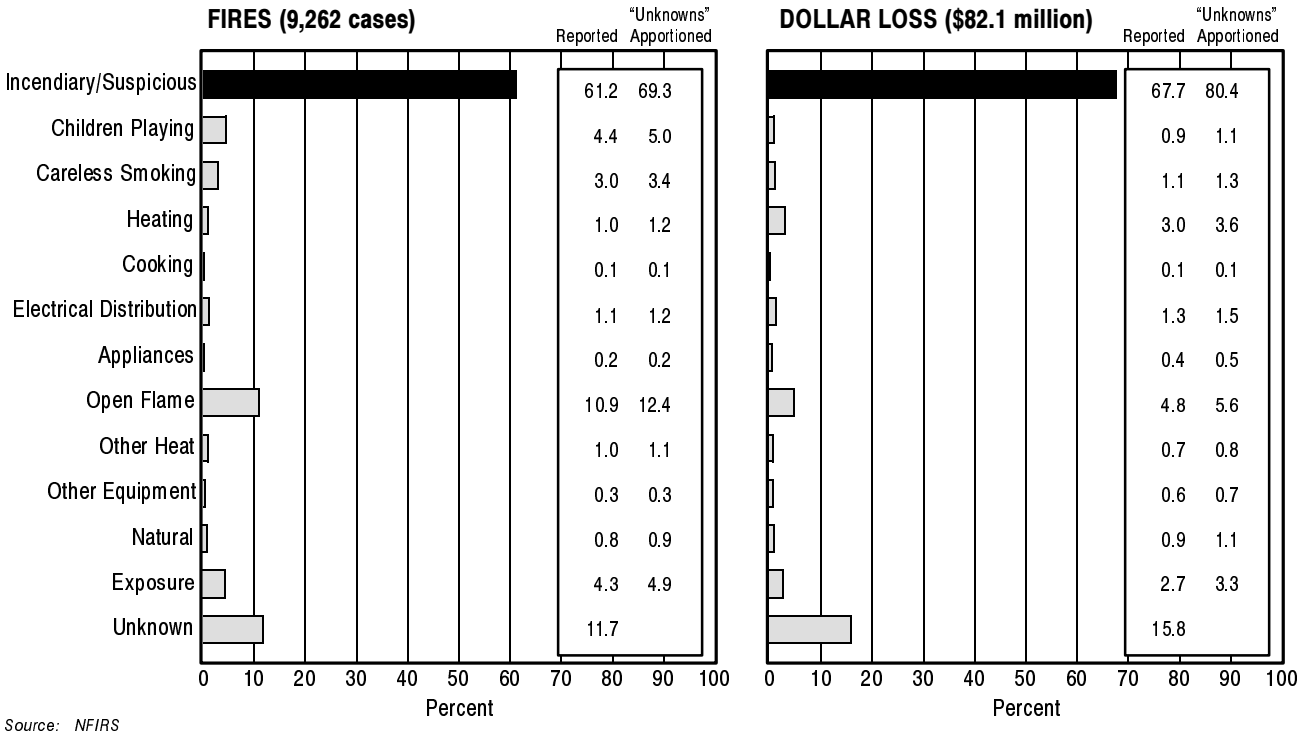
Source: NFIRS

Figure 85. Causes of 1994 Manufacturing Structure Fires and Dollar Loss



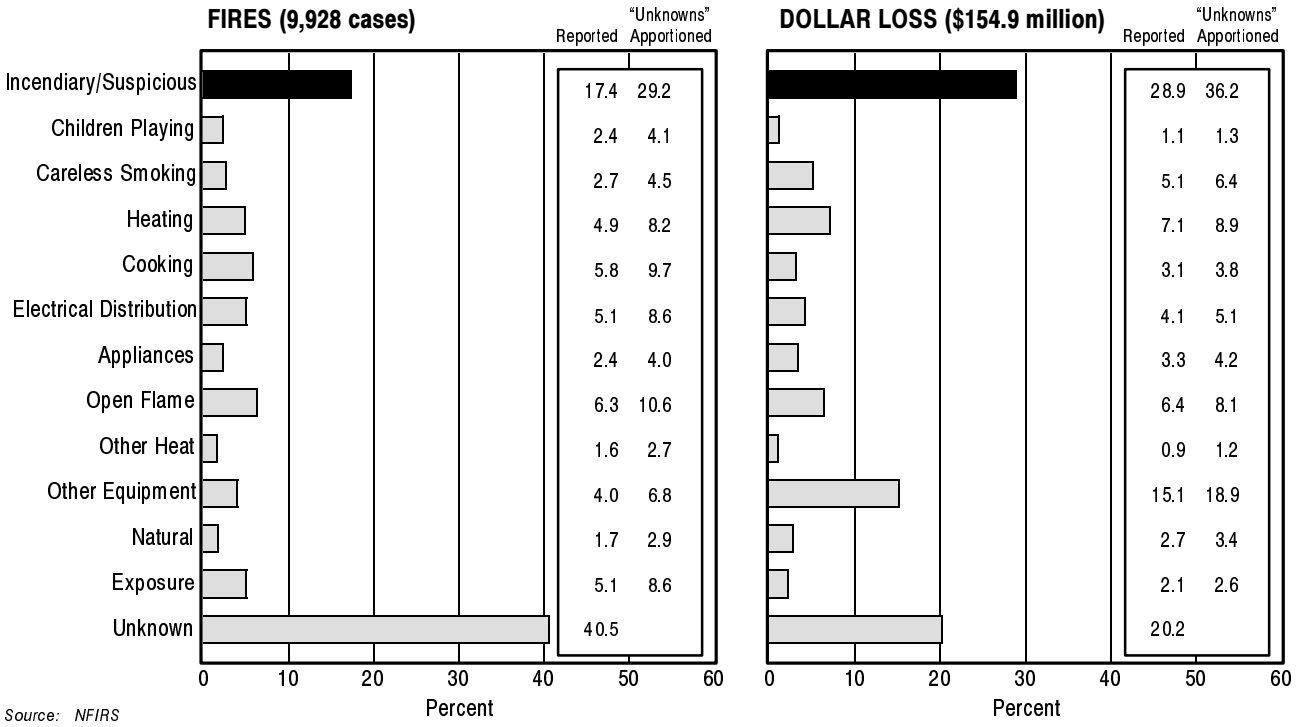
Source: NFIRS

Figure 86. Causes of 1994 Storage Structure Fires and Dollar Loss



Source: NFIRS

Figure 87. Causes of 1994 Vacant and Construction Structure Fires and Dollar Loss



Source: NFIRS

Figure 88. Causes of 1994 Outside Structure and Unknown Fires and Dollar Loss

Sprinkler Performance

Sprinkler systems with partial or complete coverage were reported being present in just 13 percent (unadjusted) of all non-residential structure fires in 1994 (Figure 89). Nevertheless, an encouraging development is that sprinkler installation is 23 percent more prevalent in 1994 than 4 years ago (from 10 to 13 percent overall). This is an increase of about 43 percent from 10 years ago and a 26 percent increase since 1990 (Figure 90). With unknowns allocated, the actual percentage of sprinkler systems present in 1994 fires might be as high as 17 percent.

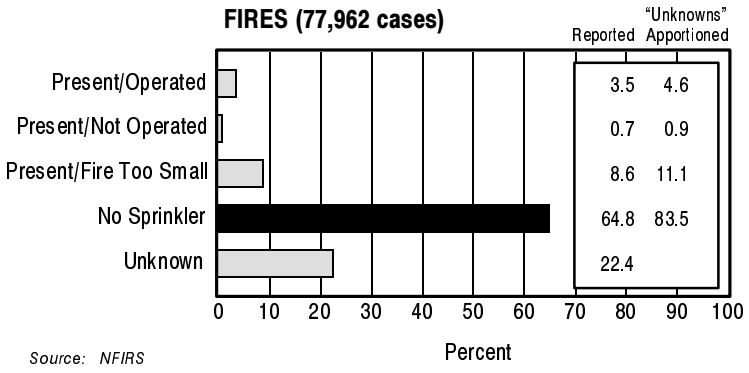
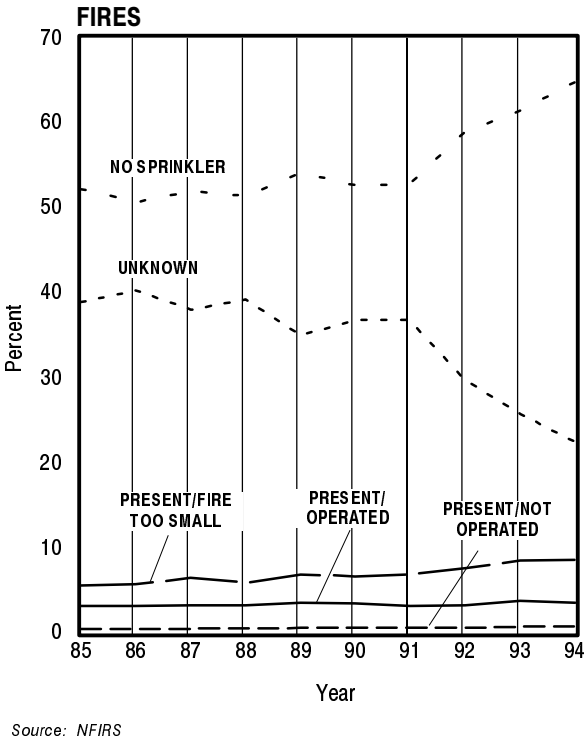


Figure 89. Sprinkler Performance in 1994 Non-Residential Structure Fires



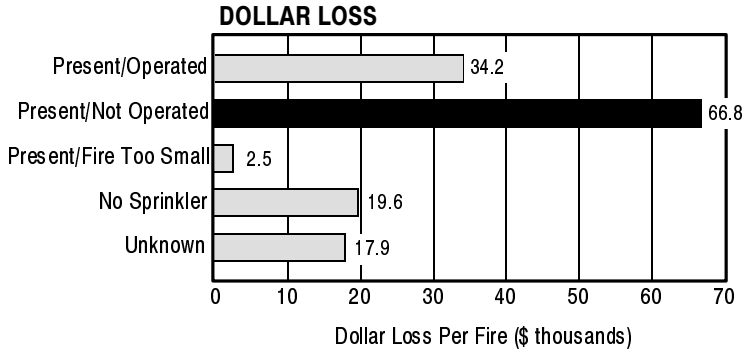
	Present/ Operated	Present/ Not Operated	Present/ Fire Too Small	No Sprinkler	Unknown
1985	3.1%	0.4%	5.5%	52.1%	38.9%
1986	3.1	0.4	5.7	50.6	40.2
1987	3.2	0.5	6.4	51.9	38.0
1988	3.2	0.5	5.8	51.3	39.2
1989	3.5	0.6	6.8	54.1	35.0
1990	3.4	0.6	6.6	52.6	36.8
1991	3.1	0.6	6.9	52.8	36.7
1992	3.2	0.6	7.6	58.9	29.7
1993	3.7	0.7	8.5	61.4	25.7
1994	3.5	0.7	8.6	64.8	22.4

Figure 90. Trends in Sprinkler Performance in Non-Residential Fires

Over the past 10 years, sprinklers were reported to have operated in only 3–4 percent of fires. When sprinklers were present, two out of every three fires were too small to set them off or were in a part of the building away from the sprinklered area.

How effective are sprinklers? It is hard to tell from the NFIRS data alone because the comparisons need to be made for similar properties with similar fire loads, with and without sprinklers. Since NFIRS combines properties of different size and values in the same fixed property class, the data need to be viewed cautiously. Sprinkler systems are more likely to be installed in large and highly valued properties than in small, inexpensive ones. The sprinkler system in a large warehouse may do an excellent job of containing a fire and yet the loss for the fire may be larger than for a fire in an unsprinklered small storage building.

One way around this problem is to compare losses when sprinklers were present and operated versus when they were present and did not operate for a reason other than the fire being too small (that is, the cases where the sprinkler failed or the fire was not near the sprinklered area). The presumption is that the places with sprinklers, whether they went off or not, are more similar to each other than to the places that did not have sprinklers. Figure 91 shows that when sprinklers operated the losses per fire were only about one-half what they were when sprinklers were present and did not operate. This suggests that sprinklers are highly effective.



Source: NFIRS

Figure 91. Sprinkler Performance in 1994 Non-Residential Dollar Loss Per Fire

VEHICLES AND OTHER MOBILE PROPERTIES

Vehicles and other types of mobile properties include all means of transportation. They account for a larger portion of the fire problem than most people realize. From 1985 to 1994, vehicles have averaged 16 percent of fire deaths, 11 percent of fire injuries, 12 percent of fire losses, and 24 percent of all reported fires, nearly one in four fires. These percentages are somewhat lower than reported in the Eighth Edition of *Fire in the United States* (1990), which is an encouraging trend.

The vast majority of fires, casualties, and property loss from mobile property involves cars and trucks, with cars clearly dominating this group. Fire departments go to about as many fires involving vehicles as they do involving residences.

Overview of Trends

The trends in fires, fire deaths, injuries, and property loss are shown in Figure 92. Mobile property total fires decreased 12 percent over the 10-year period 1985–1994 according to the NFPA annual surveys. Mobile property fire deaths and injuries trended downward sharply (26 percent and 19 percent, respectively). Mobile property loss decreased by 2 percent.

Types of Vehicles

Figure 93 shows that the vast majority of mobile property deaths, fires, injuries, and dollar loss are highway vehicles. The complexity and ambiguity in counting plane and boat fires associated with accidents are described in a later section titled "Special Data Problems."

Although the 10-year trend in highway vehicle fires, deaths, and injuries show substantial decreases (from 12 to 29 percent), the dollar loss is modest (down 4 percent). The increases in the death and injury trends in the "other" category are due to the small numbers involved.

Figure 94 gives more details on the relative proportions of the reported fire problem by type of vehicle. Automobiles and other passenger vehicles such as vans and buses outnumber trucks by three to one in fire deaths and four to one in both injuries and property loss. And automobiles have eight times as many fires as trucks. On a per-incident basis, trucks have the more serious problem, but there are vastly more car fires than truck fires.

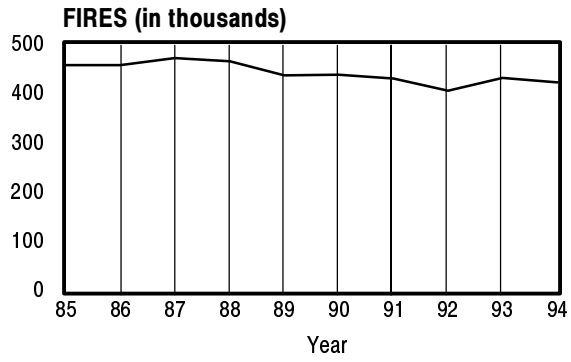
Ignition Factors

For the most part, vehicle fires have one of four origins: the aftermath of a collision, the result of a mechanical failure, the result of an act of carelessness, or the result of arson.

In 1994, most vehicle fire deaths (63 percent) follow collisions, even though collisions are the cause of only 2 percent of vehicle fires (Figure 95). These numbers are largely unchanged from 1990. Preventing such fires is largely the purview of the U.S. Department of Transportation, state and local motor vehicle agencies, and the police, but fire departments are almost always called to the scene when there is a fire or the potential of a fire.

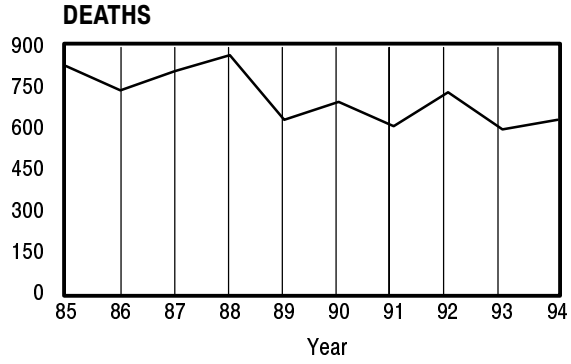
Adjusted for the unknowns, 69 percent of all fires in vehicles and 43 percent of the associated injuries come from mechanical or design problems such as broken fuel lines, faulty catalytic converters, overheating, etc.

Fires of incendiary or suspicious origin account for one in six automobile and mobile property fires. Many vehicle fires are not even investigated for arson, though some insurance companies are at least investigating the most suspicious or obviously incendiary fires before paying insurance claims. However, the arson problem may well be understated from the noninvestigation of these fires.



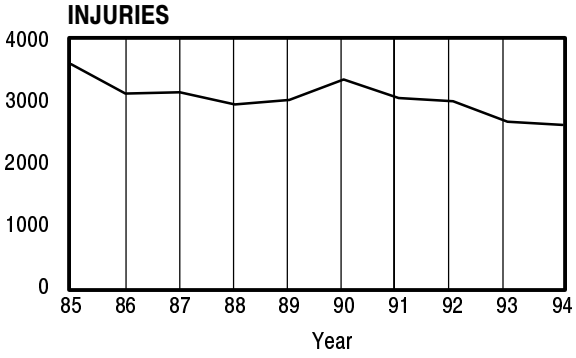
1985	456	1990	437
1986	457	1991	429
1987	471	1992	405
1988	464	1993	421
1989	436	1994	422

10-Year Trend = –11.6%



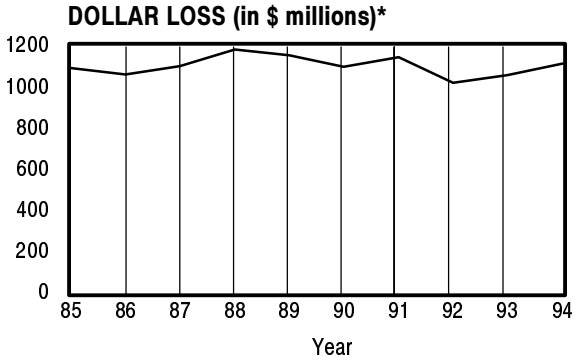
1985	825	1990	695
1986	735	1991	605
1987	805	1992	730
1988	865	1993	595
1989	630	1994	630

10-Year Trend = –25.6%



1985	3,600	1990	3,350
1986	3,125	1991	3,050
1987	3,150	1992	3,000
1988	2,950	1993	2,675
1989	3,025	1994	2,625

10-Year Trend = –19.4%



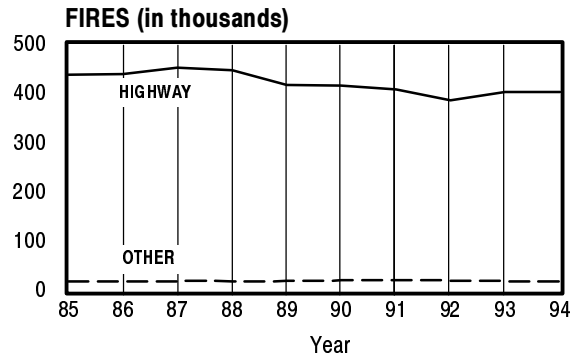
1985	$1,091	1990	$1,096
1986	1,059	1991	1,141
1987	1,098	1992	1,019
1988	1,179	1993	1,056
1989	1,151	1994	1,111

10-Year Trend = –2.0%

*Adjusted to 1994 dollars

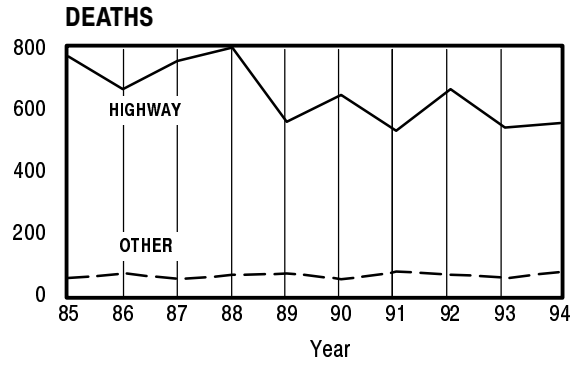
Sources: NFPA Annual Surveys and Consumer Price Index

Figure 92. Trends in Mobile Property Fires and Fire Losses



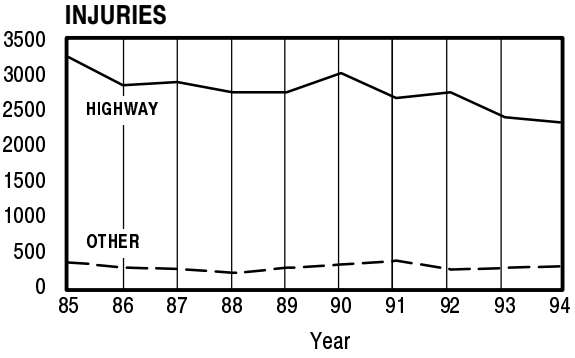
	Highway	Other		Highway	Other
1985	437	19	1990	415	22
1986	438	19	1991	407	22
1987	451	20	1992	386	20
1988	446	19	1993	402	19
1989	416	20	1994	402	20

10-Year Highway Trend = –12.4%
10-Year Other Trend = +6.6%



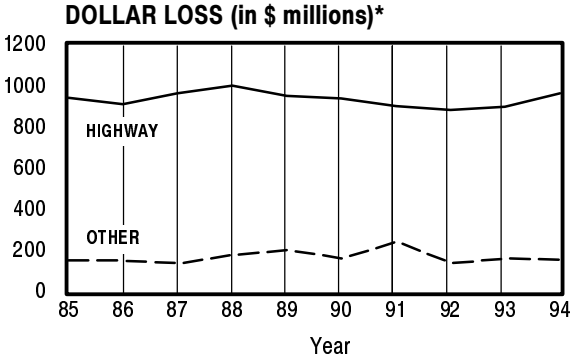
	Highway	Other		Highway	Other
1985	770	55	1990	645	50
1986	665	70	1991	530	75
1987	755	50	1992	665	65
1988	800	65	1993	540	55
1989	560	70	1994	555	75

10-Year Highway Trend = –28.7%
10-Year Other Trend = +14.9%



	Highway	Other		Highway	Other
1985	3,250	350	1990	3,025	325
1986	2,850	275	1991	2,765	375
1987	2,900	250	1992	2,750	250
1988	2,750	200	1993	2,400	275
1989	2,750	275	1994	2,325	300

10-Year Highway Trend = –21.4%
10-Year Other Trend = +2.4%



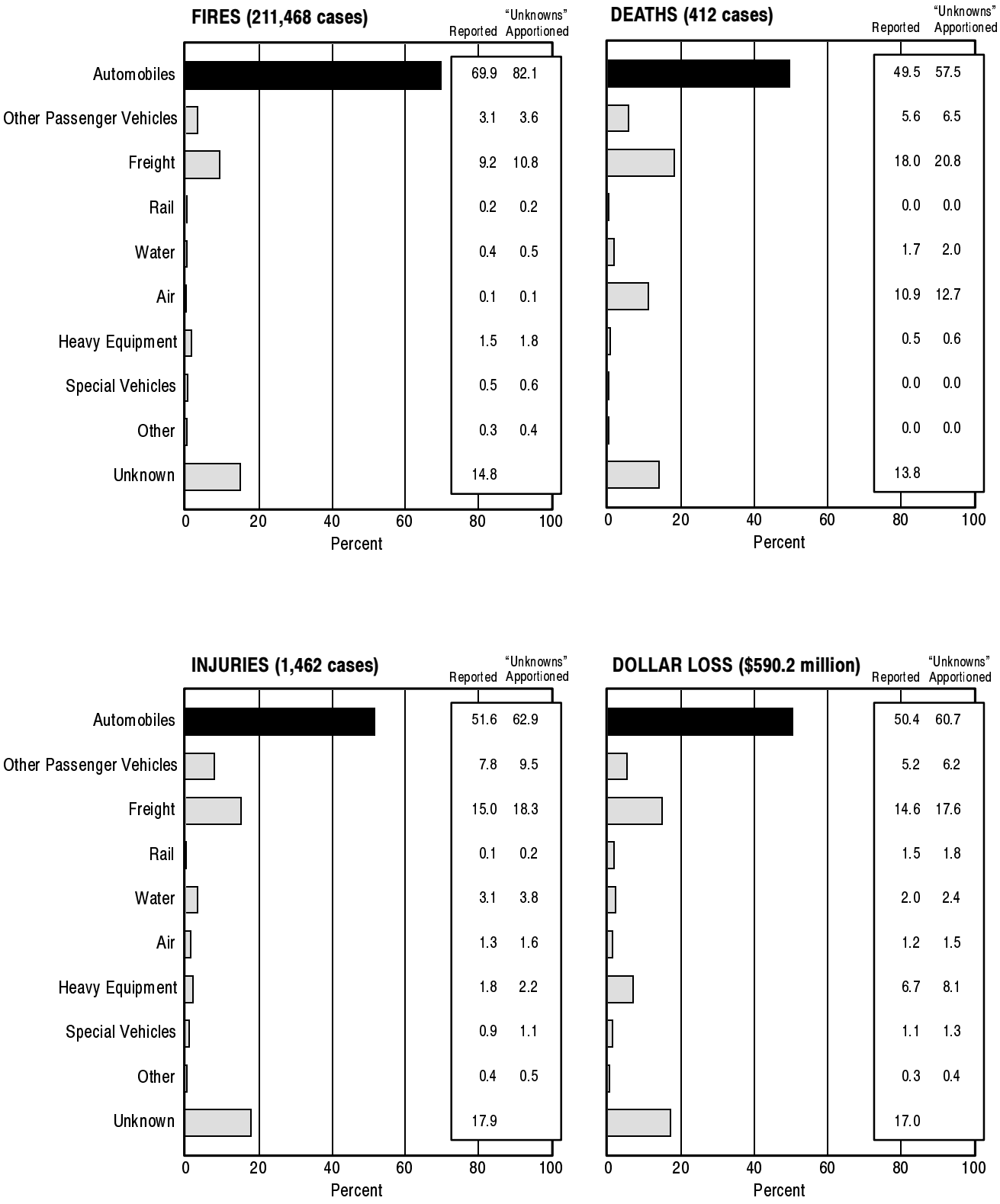
	Highway	Other		Highway	Other
1985	$ 941	$150	1990	$936	$161
1986	910	149	1991	900	242
1987	963	136	1992	881	138
1988	1,000	179	1993	897	159
1989	950	201	1994	961	150

10-Year Highway Trend = –3.6%
10-Year Other Trend = +7.9%

*Adjusted to 1994 dollars

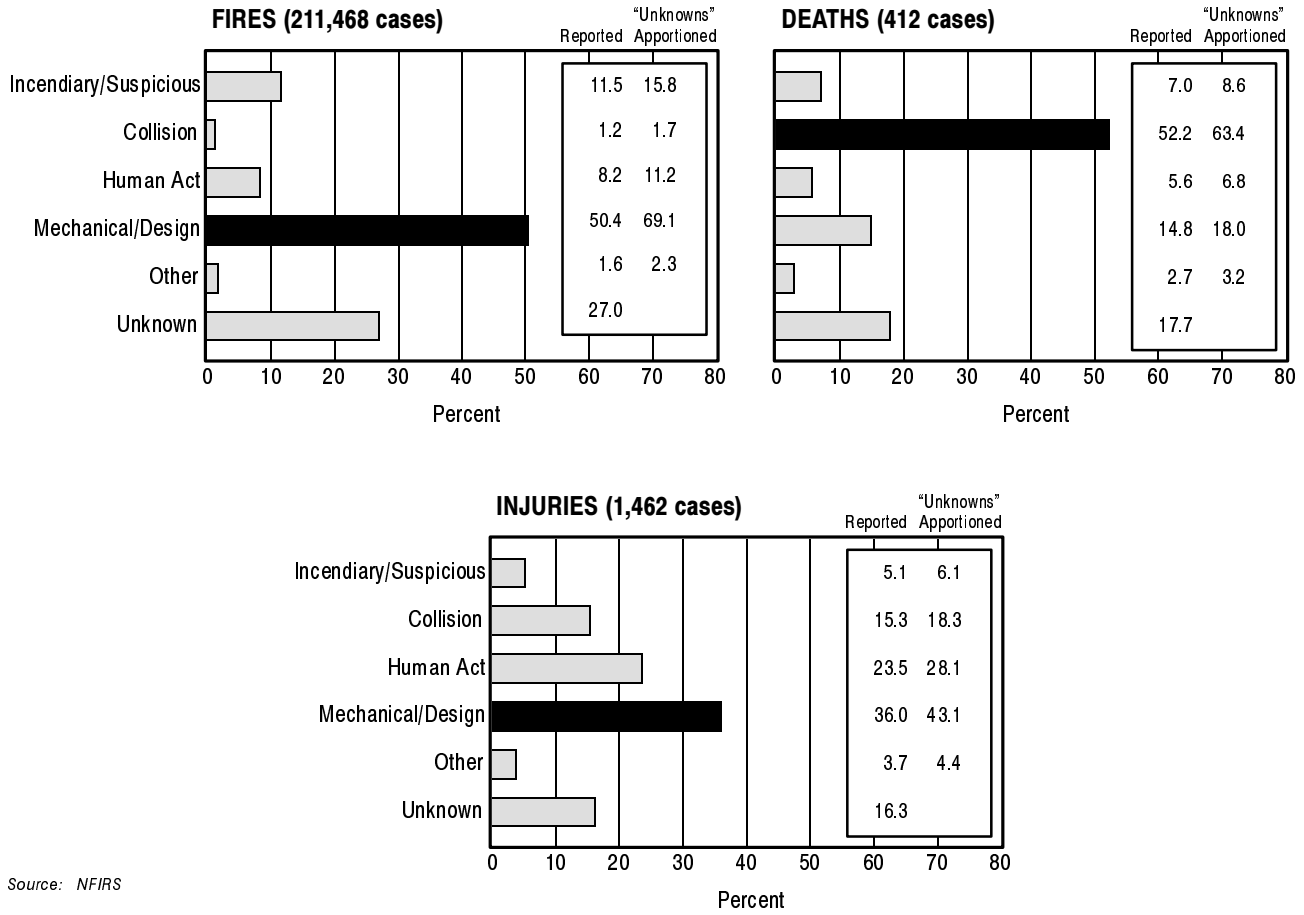
Sources: NFPA Annual Surveys and Consumer Price Index

Figure 93. Trends in Highway vs. Other Mobile Property Fires and Fire Losses



Source: NFIRS

Figure 94. 1994 Mobile Property Fires and Fire Losses by Vehicle Type

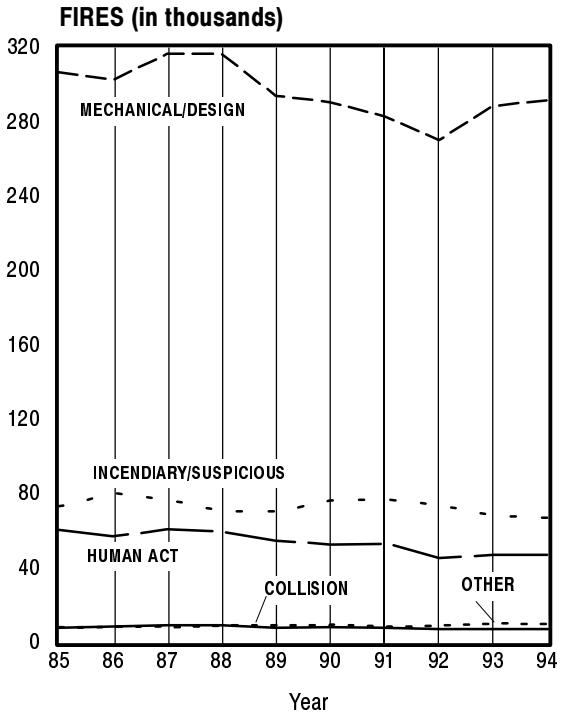


Source: NFIRS

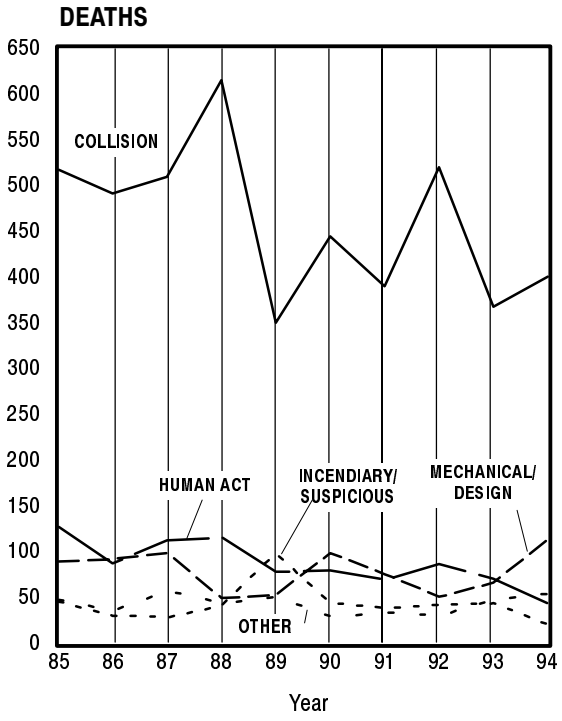
Figure 95. Ignition Factors for 1994 Mobile Fires and Fire Casualties

Carelessness (human act), including causes such as dropped or discarded cigarettes on the upholstery, parking over dry leaves with a hot catalytic converter, and misuse of flammable liquids, especially gasoline, while servicing or maintaining the car, is another major cause of vehicle fires. Carelessness accounts for 28 percent of vehicle fire injuries, though only 11 percent of fires.

In each of the past 10 years, the top ignition factor for fires (mechanical/design), deaths (collision), and injuries (mechanical/design) has remained the same—by a wide margin (Figure 96). The upward trend of deaths from collisions was interrupted in 1989 which saw a sharp drop, but deaths increased again in 1990. Injuries from mechanical or design factors reached their highest level in 1993 but dropped to their lowest level in 1994. The 10-year arson-related trend has remained somewhat stable.



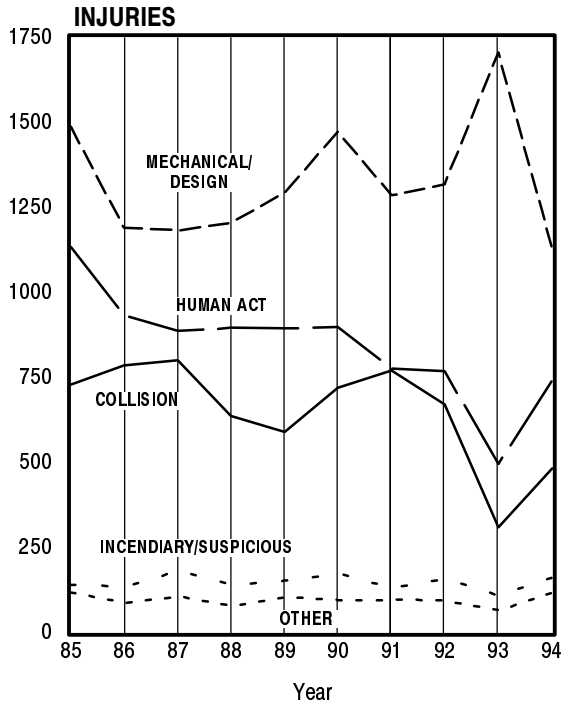
	Incendiary/ Suspicious	Collision	Human Act	Mechanical Design	Other
1985	73.0	7.9	60.3	306.3	8.1
1986	80.0	8.6	57.1	302.3	8.6
1987	76.4	9.1	60.9	316.5	8.2
1988	70.4	9.2	59.3	316.4	9.1
1989	70.1	7.9	54.7	293.7	9.2
1990	76.2	8.1	52.5	290.3	9.4
1991	76.9	7.6	53.1	282.6	8.4
1992	73.4	6.9	45.4	270.1	9.2
1993	68.1	6.9	46.9	288.4	10.2
1994	66.5	7.1	47.3	291.6	9.5



	Incendiary/ Suspicious	Collision	Human Act	Mechanical Design	Other
1985	47	517	127	89	45
1986	35	491	87	92	30
1987	57	509	112	99	28
1988	44	615	116	49	41
1989	51	350	78	53	98
1990	29	444	79	98	44
1991	33	390	69	75	38
1992	30	520	86	51	42
1993	48	367	70	66	44
1994	54	400	43	113	20

Continued on next page

Figure 96. Trends in Ignition Factor Causes of Mobile Property Fires and Fire Casualties



	Incendiary/ Suspicious	Collision	Human Act	Mechanical Design	Other
1985	138	728	1,131	1,486	115
1986	132	784	930	1,189	86
1987	179	799	886	1,181	105
1988	139	635	895	1,203	77
1989	151	588	892	1,292	103
1990	172	717	896	1,471	94
1991	128	769	774	1,284	95
1992	158	669	766	1,316	92
1993	107	308	494	1,703	63
1994	161	480	738	1,130	116

Sources: NFPA Annual Surveys and NFIRS

Figure 96. Trends in Ignition Factor Causes of Mobile Property Fires and Fire Casualties (cont'd)

Because automobile fires are such a large part of the entire mobile property fire problem, the cause profiles for automobile fires in 1994 are extremely similar to those for mobile properties (Figure 97 compared to Figure 95).

Fire departments might well consider adding tips on vehicle fire prevention to the rest of their prevention program in light of the large magnitude and the significant work burden that vehicle fires put on fire departments. The problem has not been given enough attention.

Special Data Problems

When there are fatalities associated with a mobile property accident such as a collision between two cars, it is often difficult to determine whether the fatalities were the result of the mechanical forces or the fire that ensued. Because of the very large number of vehicle fatalities occurring in this country each year and the frequency of fires associated with these accidents, there can be a significant error in estimating the total number of fire deaths if this problem is not carefully addressed. A fire fatality should be counted only if a person was trapped and killed by the fire, rather than killed on impact and subsequently exposed to the fire.

In plane crashes, it is thought that fewer people would die each year if the fire hazard could be reduced. It is not clear how well plane crashes are reported to NFIRS. In 1985, the NFIRS-based plane fire deaths was 57, while the number from the Federal Aviation Administration count was

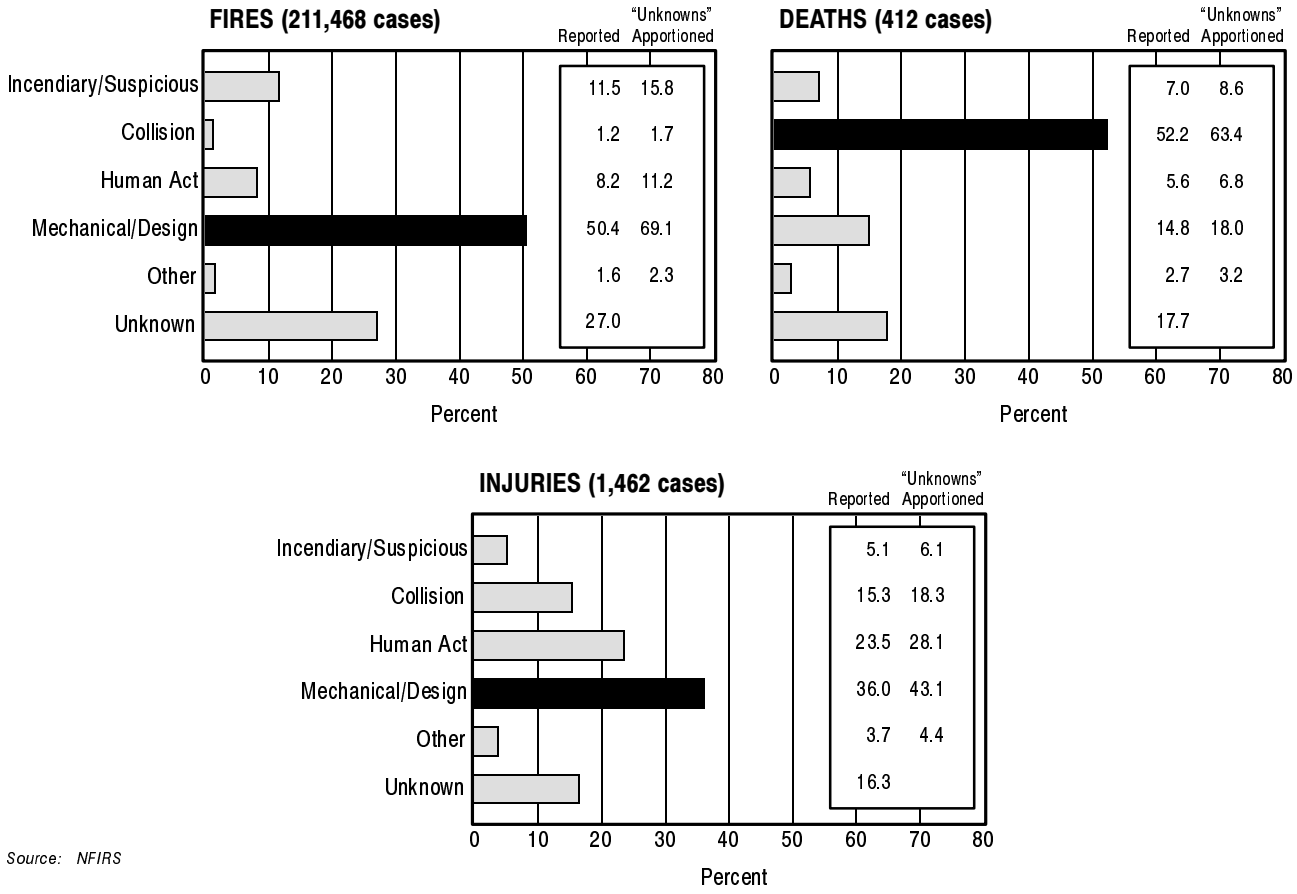


Figure 97. Ignition Factors for 1994 Automobile Fires and Fire Casualties

72—a difference that is not large. However, missing one large crash with fire fatalities could change the mobile property fire death statistics by 20–40 percent in a given year, so it is important that these all be reported.

OUTSIDE PROPERTIES

The "outside properties" category includes all fires outside of structures other than vehicle fires. In NFIRS terminology, this includes fires where the type of situation found either is outside of the structure where the burning material has a value or are tree, brush, grass fires, or refuse fires. Grouped in the "other" category are fires whose situation found is not classified, flammable liquid spills out of doors with ensuing fires, and explosions. A subset of outside fires (wildland fires) is discussed in Chapter 6.

Outside fires comprise almost half of all fires (44 percent in 1994) and have been increasing slowly in number and as a proportion of the total number of fires, as was seen in Figure 28, Chapter 2. While large in number, they account for only 3 percent of fire deaths, 4 percent of reported injuries, and, in most years, 3–5 percent of reported property loss. These numbers may not, however,

reflect the true nature of the problem because of underreporting and the difficulty in setting a price tag on outside fires. Also, many wildland fires are not reported to agencies reporting to NFIRS or to the NFPA annual survey.

Overview of Trends

Figure 98 shows the trends in outside fires. The numbers of fires are enormous—from 800,000 to 1 million. Deaths from outside fires plus miscellaneous other properties not covered elsewhere number 70–130 a year; injuries range from 950 to 1,575. Deaths have a significant 10-year downward trend but this is due to the small numbers; injuries have a slight upward trend. Over the 10 years, adjusted dollar loss has continued to climb for outside properties with value, with an exceptional high agricultural loss in 1988 and high timber loss in 1992.

Estimating dollar loss for outside fires is difficult. To illustrate this problem, consider Figure 99, derived from unscaled (raw) NFIRS data. The estimates are low except for 1986, when one fire in a pineapple plantation in Hawaii was valued at half a billion dollars. (It is not reflected in NFPA data for that year.) That fire represents the largest dollar loss ever entered in NFIRS and may or may not be a fair assessment. Note that the large timber fire reported by NFPA is not reported in NFIRS.

Property Types

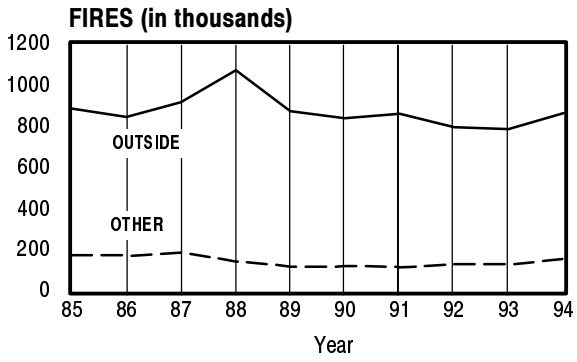
Figure 100 shows the relative proportions of the three components of reported outside fires for 1994. Trees, brush, and grass fires account for the most numbers of fires, deaths, injuries, and dollar loss. A majority of deaths, injuries, and dollar loss, however, are unknown. Better reporting to NFIRS is required for outside fires.

When Fires Occur

TIME OF DAY. Over half of all outside fires occur from 1:00 to 9:00 p.m. They are very low in the early hours of the morning, when few people are outside (Figure 101).

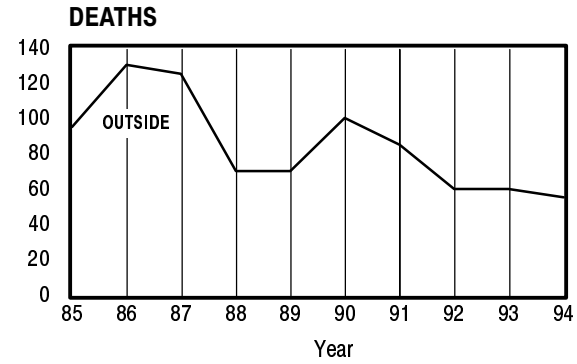
MONTH OF YEAR. Outside fires are usually lowest in the fall and winter months and high during late spring and the summer (Figure 102). In 1994, April and July were the months with the highest fire rate, whereas July and June were first and second in 1990. In recent years, local and state governments have placed more rigorous restrictions on burning leaves, which might account for the low autumn numbers. Wetter-than-usual weather, too, may have played a role. The details of the monthly variations are not obviously explained and need more study by the type of outdoor property and by cause.

DAY OF WEEK. As in 1990, outside fires in 1994 are highest on the weekend, when more people are outdoors (Figure 103). Monday was also a peak day.



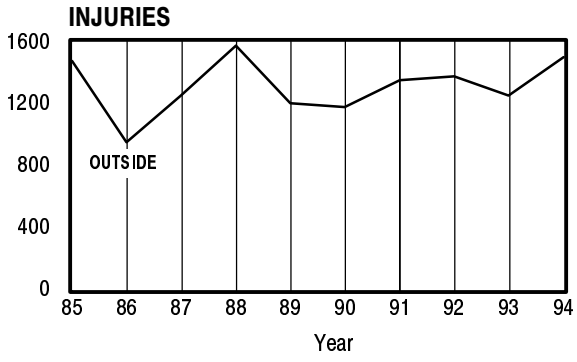
	Outside	Other		Outside	Other
1985	884.0	172.0	1990	838.5	120.0
1986	845.0	170.0	1991	859.5	113.0
1987	916.5	184.5	1992	793.5	128.5
1988	1,072.0	142.0	1993	783.5	127.0
1989	873.5	118.0	1994	861.5	157.0

10-Year Outside Trend = –11.3%
10-Year Other Trend = –26.5%



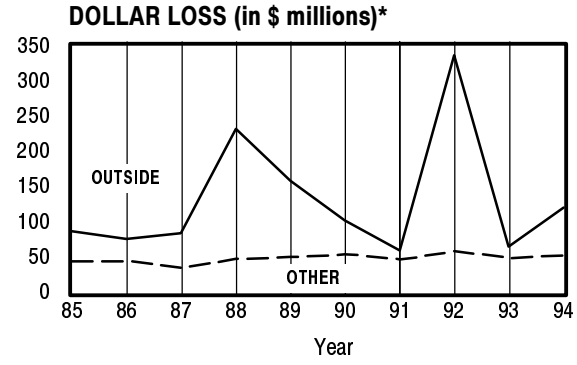
1985	95	1990	100
1986	130	1991	95
1987	125	1992	60
1988	70	1993	60
1989	70	1994	55

10-Year Outside Trend = –47.7%



1985	1,475	1990	1,175
1986	950	1991	1,350
1987	1,250	1992	1,375
1988	1,575	1993	1,250
1989	1,200	1994	1,500

10-Year Outside Trend = +9.8%



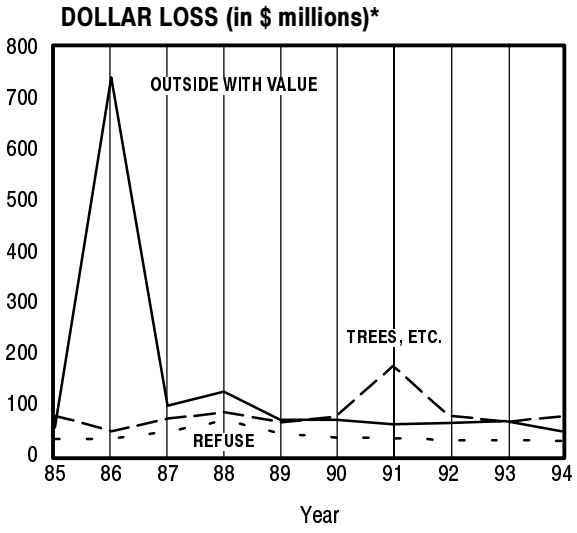
	Outside	Other		Outside	Other
1985	$ 86.8	$44.1	1990	$102.1	$54.4
1986	75.7	44.6	1991	59.8	46.8
1987	83.5	35.2	1992	335.9	58.1
1988	231.8	47.6	1993	64.6	48.2
1989	157.8	50.2	1994	120.0	53.0

10-Year Outside Trend = +46.5%
10-Year Other Trend = +28.7%

*Adjusted to 1994 dollars

Sources: NFPA Annual Surveys and Consumer Price Index

Figure 98. Trends in 1994 Outside and Other Property Type Fires and Fire Losses



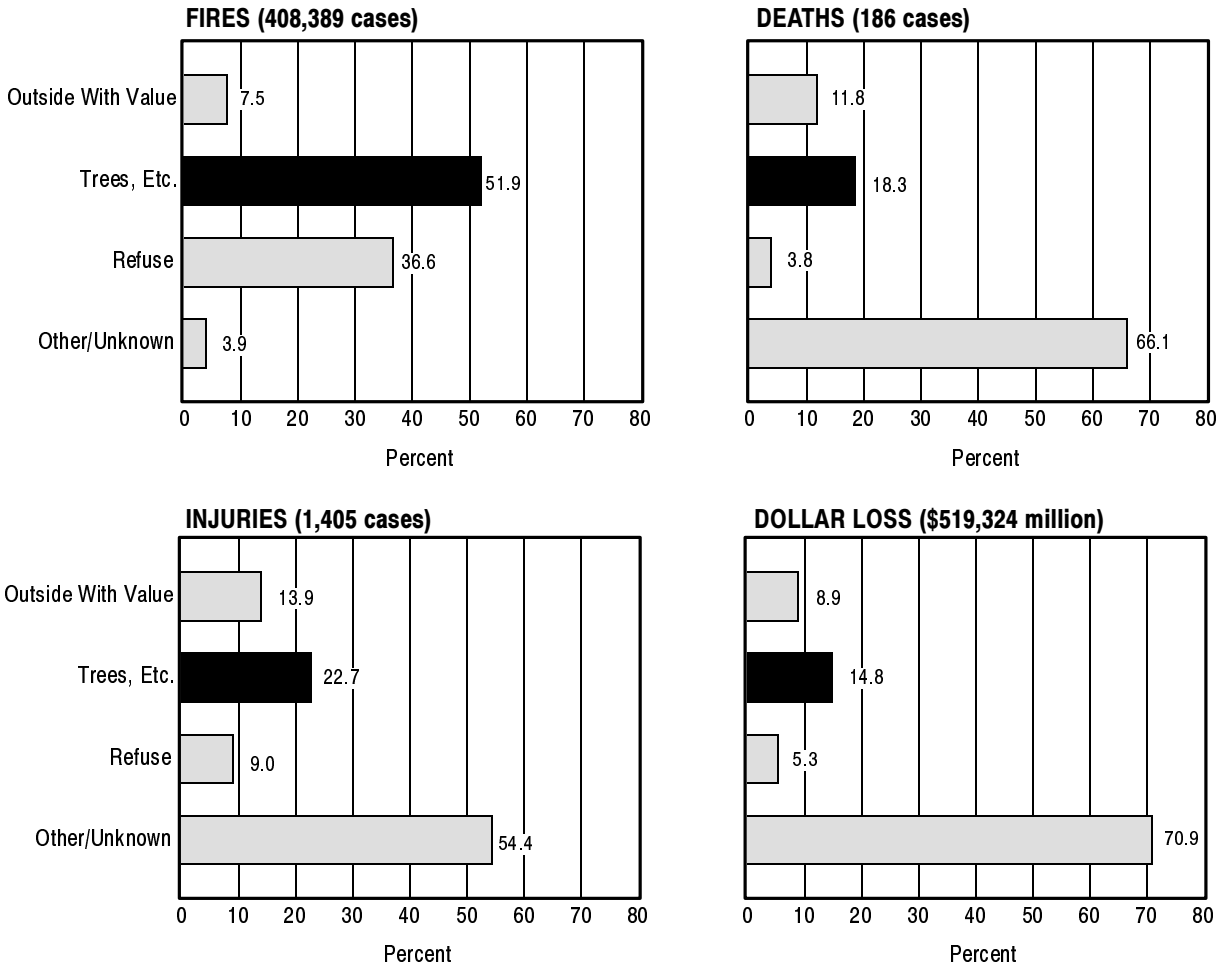
	Outside With Value	Trees, Etc.	Refuse
1985	$ 54.7	$ 77.2	$ 31.9
1986	740.4	47.4	33.7
1987	96.8	72.7	46.5
1988	125.1	84.1	68.1
1989	69.7	65.2	41.6
1990	69.1	76.8	34.5
1991	61.3	175.2	33.7
1992	63.0	77.1	29.4
1993	67.5	65.5	29.4
1994	46.4	77.0	27.5

10-Year Outside With Value Trend = –100.0%
10-Year Trees, Etc. Trend = +34.0%
10-Year Refuse Trend = –32.0%

*Adjusted to 1994 dollars

Sources: NFIRS and Consumer Price Index

Figure 99. Trends in Outside Fire Dollar Loss by Property Type



Source: NFIRS

Figure 100. 1994 Outside Fires and Fire Loss by Property Type

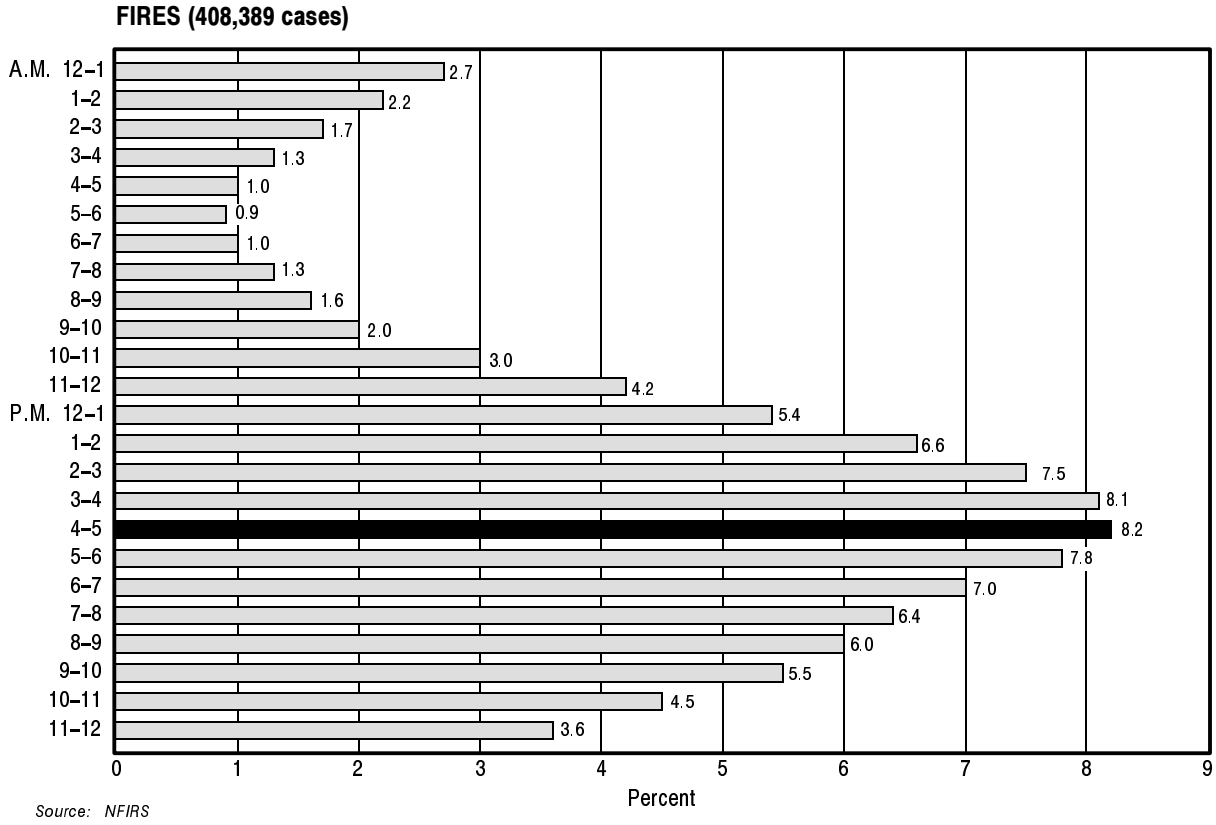


Figure 101. Time of Day of 1994 Outside and Other Fires

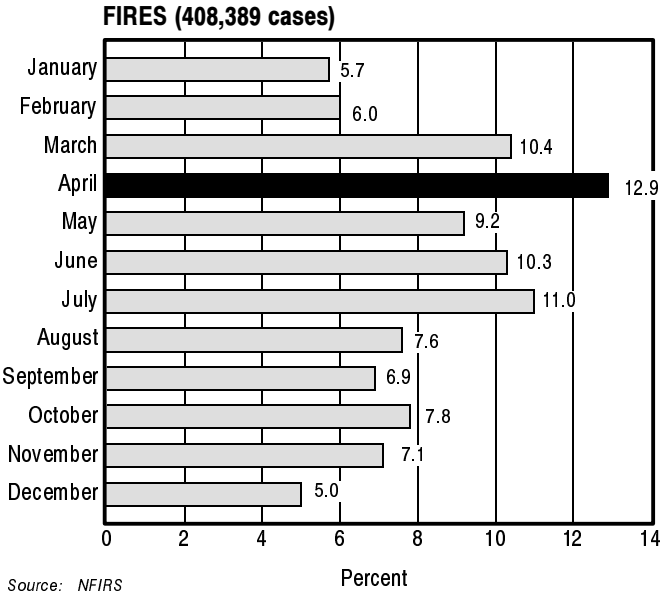


Figure 102. Month of Year of 1994 Outside and Other Fires

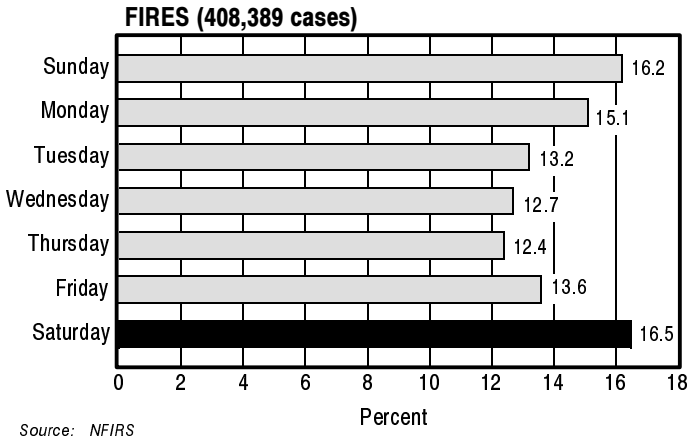


Figure 103. Day of Week of 1994 Outside and Other Fires

Causes

The leading cause of outside fires is arson, with many thought to be set by children. Figure 104 shows the cause profiles for each outside fire category. Again, a large percentage of outside fires have unknown causes.

For outside fires with value, 34 percent of fires are thought to be arson. The rest of the fires are scattered across many categories, with open flame and electrical problems in second and third place, respectively.

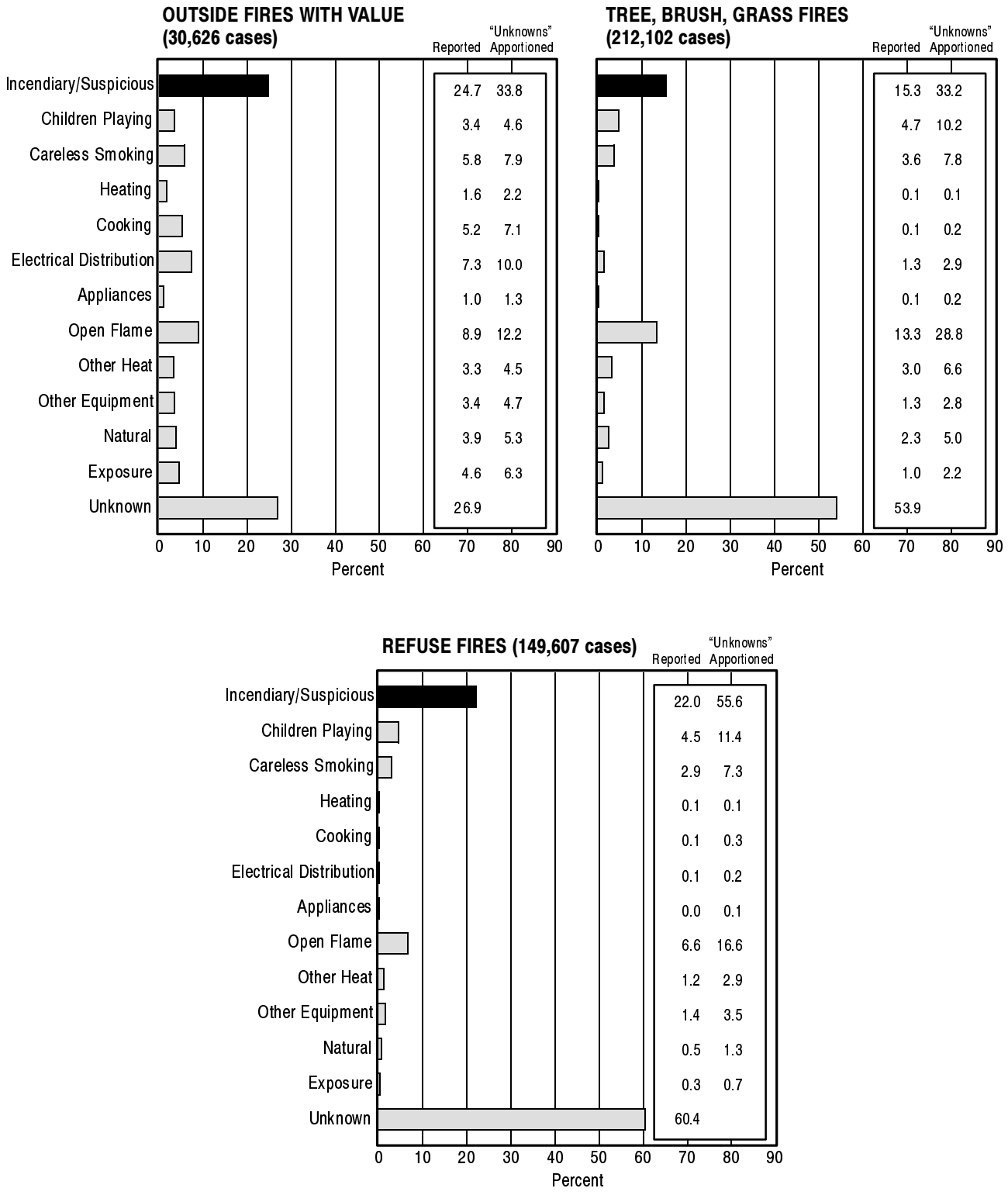
More than half of tree, brush, and grass fires had unknown cause. Among the known causes, the two that stand out are arson and open flame, which includes open fires used for cooking. These two causes account for over half of the fires with cause. Following these, but at much lower rates, are children playing and careless smoking. This is the same pattern as was reported in 1990.

For refuse fires, again over half had no reported cause. As in 1990, over half of the reported causes in 1994 were reported as arson, with another 17 percent from open flame (e.g., matches), 11 percent from children playing, and 7 percent from smoking (e.g., a discarded cigarette). Note that refuse fires set inside buildings are structural fires, even if they do no damage, and are reported as part of the property type in which they occur.

Special Data Problems

Setting a value for outside fire damage is a perennial problem. Although it is difficult to assign a dollar value to grass, tree, and rubbish fires, the damage from these fires often requires labor beyond that of the fire department to clean up and restore the area and also causes esthetic problems that are an intangible. Also, some outside fires spread to structural properties and may be reported as structural fires rather than an outside fire with exposure to structures.

Forest fires and other wildfires to which local departments are not called will not be reported to NFIRS if the state or federal agency with principal authority for fighting the fire is not participat-



Source: NFIRS

Figure 104. Causes of 1994 Outside Fires by Type

ing in NFIRS. Data from the Departments of Agriculture and Interior are needed to complete the picture.

Another significant problem with data on outside fires is determining their cause. Often the area of origin is obliterated, the people involved have fled, and one is not sure exactly what caused the fire—an unattended campfire, a discarded match or cigarette, lightning strikes, children playing, or even an intentionally set fire. Thus the percent of causes left as unknown is especially high for this category of fires.

USFA RESOURCES ON FIRES IN NON-RESIDENTIAL STRUCTURES

USFA conducts special studies to address specific problems and current issues facing the nation's fire and rescue service. The technical reports produced under the Major Fires Investigations series analyze major or unusual fires with emphasis on sharing lessons learned. They are directed primarily to chief fire officers, training officers, fire marshals, and investigators as a resource for training and prevention.

Major Fire Investigations reports on fires in non-residential properties include the following: *Evacuation of Nanticoke, Pennsylvania Due to Metal Processing Plant Fire, March 1987* (#005); *Fire and Explosions at Rocket Fuel Plant, Henderson, Nevada, May 1988* (#021); *Industrial Plastics Fire Major Triage Operation, Flint, Michigan, November 1988* (#025); *High-Rise Office Building Fire, One Meridian Plaza, Philadelphia, Pennsylvania, February 1991* (#049); *Indianapolis Athletic Club Fire (Two Firefighter Fatalities), February 6, 1991*; *Major Propane Gas Explosion and Fire, Perryville, Maryland, July 1991* (#053); *Twenty-five Fatality Fire at Chicken Processing Plant, Hamlet, North Carolina, September 1991* (#067); *New York City Bank Building Fire: Compartmentation vs. Sprinklers, January 1993* (#071); *The World Trade Center Bombing: Report and Analysis* (#076); *Four Firefighters Die in Seattle Warehouse Fire, Seattle, Washington* (#077); *California Interstate Bank Building Fire, Los Angeles, May 1988*; *California—Conservative Approach to Chemical Plant Fire, Ventura County, April 1989*; *Georgia—Five-Fatality High-Rise Office Building Fire, Atlanta, June 1989*; *Massachusetts—Swimming Pool Chemical Plant Fire, Springfield, June 1988*; *Ohio—Sherwin–Williams Paint Warehouse Fire, Dayton, May 1987*; and *Texas—Philips Petroleum Chemical Plant Explosion and Fire, Pasadena, October 23, 1989.*

These publications are available by writing to:

U.S. Fire Administration
Federal Emergency Management Agency
Publications Center, Room N310
16825 S. Seton Avenue
Emmitsburg, MD 21727

Documents may also be ordered via the World Wide Web: *http://www.usfa.fema.gov.* USFA publications are free.